

# **Interest Groups, Litigation, and Agency Decisions: Evidence from the Endangered Species Act**

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## *Abstract*

Interest groups are known to influence regulatory activity. Action-forcing litigation, the most direct way in which groups can affect regulatory decision-making, is particularly relevant for implementation of the ESA. Environmental organizations have filed hundreds of lawsuits to compel listing and critical habitat designation for imperiled species. This paper uses a unique dataset to examine the role of citizen litigation in ESA implementation. I analyze the direct impact of lawsuits filed on behalf of a species and the effects of lawsuits filed on behalf of other species to assess whether there are spillovers caused by resource allocation constraints created by litigation. Results suggest that citizen lawsuits have a positive impact on ESA implementation, and that the magnitude of these effects is significant. There is no evidence of negative spillovers from litigation on behalf of other species.

Key Words: Endangered Species Act, Citizen Suits, Action-Forcing Litigation, Political Economy.

JEL Codes: L31, L51, K32, K41, Q57, Q58

## **I. Introduction**

Every major federal environmental law in the U.S. provides for citizen suits, which have been described as the most pervasive and prominent innovation in the modern environmental era (Thompson 2000). Individual citizens or groups can sue parties who fail to comply with environmental legislation, or they can sue government agencies to compel them to take specific regulatory actions. The latter type of citizen suit, known as action-forcing litigation, is arguably the most direct way in which interest groups can affect regulatory agency decision-making.<sup>1</sup>

Action-forcing litigation is particularly relevant for implementation of the Endangered Species Act (ESA, the Act). Environmental organizations have filed hundreds of lawsuits against the U.S. Fish and Wildlife Service (FWS) to compel listing and critical habitat designation for imperiled species. The impact of litigation could be significant. Litigating groups and other advocates contend that lawsuits accelerate or force regulatory implementation that otherwise would be delayed or not take place (Greenwald et al. 2006; Bevington 2009). Critics question the effectiveness of lawsuits or argue that litigants determine regulatory priorities instead of agency personnel, and that litigation diverts scarce resources from implementation (Patlis 2003; Jesup 2013). Opponents in Congress have suggested reforming the Act to limit the ability of environmental groups to bring suits (U.S. House of Representatives 2011). Whether these lawsuits are effective in compelling agency action and should therefore be encouraged, or distort agency decisions by imposing the plaintiffs' preferences or using up resources, and should hence be curtailed, are relevant policy questions. Despite the prominent role of citizen suits in ESA implementation, the

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<sup>1</sup> For instance, *Sierra Club v. Ruckelshaus* (1972) resulted in the creation of the Prevention of Significant Deterioration program under the Clean Air Act, and the U.S. Environmental Protection Agency listed lead as a criteria pollutant following lawsuits by the Natural Resources Defense Council (Glicksman 2004).

economics literature has paid little attention to this type of private group intervention, in this context or others, and these questions are yet to be addressed.

This paper provides empirical evidence that sheds light on these questions. I use a unique and comprehensive dataset of citizen suits, species characteristics, and administrative actions to examine the role of citizen litigation in ESA implementation. I analyze the direct impact of lawsuits filed on behalf of a species on its listing status, critical habitat designation, and recovery expenditures. I also examine the effects of lawsuits filed on behalf of other species to assess whether there are spillovers caused by litigation activity.

Results suggest that citizen lawsuits affect ESA implementation. Species targeted in lawsuits are more likely to be listed and have critical habitat designated, and they are allocated more recovery funds. The magnitude of these effects is significant for typical levels of litigation activity. I do not find evidence of negative spillovers on listing or recovery expenditures from litigation on behalf of other species, and some evidence of a small positive spillover on critical habitat designation.

In the next section of the paper, I provide background on ESA implementation and private litigation, as well as on the relevant literature. In section 3, I describe the data and empirical strategy. Section 4 presents the results, while section 5 describes sensitivity analyses. In section 6, I discuss the results, and in the final section I present a summary and conclusion.

## **II. Background**

### *Endangered Species Act Implementation and Citizen Litigation*

Section 4 of the ESA mandates FWS to determine whether species are threatened or endangered. With this determination, the species is considered “listed” under the ESA.

Listing protects the species from direct harm, as well as indirect harm through habitat modification. Additionally, the Act requires that the agency, “to the maximum extent prudent and determinable”, designate critical habitat concurrently with listing.

Listing decisions must be based only on the best data available, and cannot take into account economic impacts. Critical habitat designation is also based on the best data available, but must consider economic and other impacts. FWS can exclude areas from critical habitat if costs of designation exceed its benefits.

There are two paths for listing under the ESA. The first path is for FWS to issue a listing proposal or place the species on the list of candidates for listing. These actions are discretionary and do not have specified deadlines. The second path is triggered by a citizen petition for listing. Once FWS receives a petition, the ESA mandates a series of steps, each with a corresponding statutory deadline. The agency must respond within 90 days to the maximum extent practicable (a 90-day finding). There are two possible outcomes from this initial review. If FWS determines that the listing is not warranted, the petition process is completed. If the agency finds that listing may be warranted, it must initiate a review of the status of the species. FWS has 12 months from receipt of the petition to issue a determination (a 12-month finding). The status review process has three possible outcomes. First, if listing is not warranted, the petition process concludes. Second, FWS can decide that listing is “warranted but precluded”, which means that a listing is necessary, but other species have a higher priority. The species is placed on the candidate list, and must be reassessed annually. Third, FWS can decide that listing is warranted, and must then prepare a proposed listing rule. This is followed by a 60-day period for public comments. If the decision stands, FWS issues a final listing rule. Concurrently, the agency must designate

critical habitat for the species, unless designation is considered “not prudent.” Figure 1 summarizes this timeline and deadlines.

There has always been a significant disparity between FWS’ responsibilities, determined by Section 4 statutory requirements, and the resources allocated for these activities. Indeed, the agency has faced a backlog in listing decisions almost since the inception of the ESA (Jesup 2013). Additionally, the agency’s decisions are closely watched by interest groups. This creates a setting in which these groups are keen to intervene, and they do so largely through litigation.

Section 11 of the ESA allows any person to file a civil suit (known as a citizen suit) against the Department of the Interior or FWS for failure to perform the nondiscretionary acts mandated by Section 4 within the prescribed time frame (known as deadline claims). Indeed, any delay in the required findings can lead to litigation, for which the agency does not have adequate legal defense, since the requirements are statutory (GAO 2017). Lawsuits may also challenge the merit of agency actions. Environmental nonprofit groups began using citizen suits against FWS as an advocacy tool in the 1990s (Greenwald et al. 2006; Bevington 2009; Jesup 2013; Puckett et al. 2016).<sup>2</sup> The main emphasis during most of the initial decade of litigation was to force the agency to address the listing backlog. From the late 1990s on, the focus switched to compelling critical habitat designation (Bevington 2009; Jesup 2013).

Table 1 shows the total number of citizen suits per year during the study period and the lawsuits filed in each FWS administrative region.<sup>3</sup> There are 565 lawsuits in the data,

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<sup>2</sup> Very few lawsuits were filed during the late 1980s. The first reported judicial decision on a pure deadline claim was issued in 1992 (Jesup 2013).

<sup>3</sup> There are nine FWS regions: Pacific (Region 1), Southwest (Region 2), Midwest (Region 3), Southeast (Region 4), Northeast (Region 5), Mountain-Prairie (Region 6), Alaska (Region 7), Pacific Southwest (Region 8), and Headquarters (Region 9). A map showing the states in each region is in Figure A1 in the online appendix.

averaging 21 lawsuits per year. The number of lawsuits increased more or less steadily over the study period, reaching a peak of 55 in 2010. Settlement agreements in 2011, which included restraints on additional filings, reduced litigation after that. Most lawsuits were filed in Regions 1, 2, and 6, perhaps because ESA litigation was initially driven by a small number of environmental groups, which were located in western states, and because many western states have relatively large numbers of threatened species (California and Hawaii are the two states with the most endangered species).<sup>4</sup>

A key feature of ESA Section 4 litigation is that a lawsuit can be filed every time FWS misses a statutory deadline, as well as to challenge agency findings made within the prescribed deadlines or following litigation. This means that several lawsuits can be filed for a given individual species before it is listed, in addition to post-listing litigation requiring critical habitat designation. In general, it is not uncommon for the same issues to be litigated repeatedly (Patlis 2003; Greenwald et al. 2006; Bevington 2009; Jesup 2013; GAO 2017).<sup>5</sup> For example, in response to a petition to list the Canada Lynx in 1994, FWS initially concluded that listing was not warranted, and this decision was challenged in court in 1995. In response, the agency found that listing was warranted but precluded; this finding was also challenged in a lawsuit in 1997. Finally, FWS listed the lynx as threatened in 2000, and was sued again to force a listing as endangered instead (Glicksman 2004). The species was finally listed as threatened in 2003. It is also not uncommon for different plaintiffs to file separate lawsuits seeking the same action.

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<sup>4</sup> Results are generally robust to estimation with a sample that excludes these regions, but sample size decreases considerably.

<sup>5</sup> When species have large habitat ranges, lawsuits for the same species can be filed in different district courts, and sometimes these are in different administrative regions. Cases filed in different administrative regions are treated independently, since they are in different judicial districts and therefore different jurisdictions.

Faced with an increasing number of lawsuits, FWS has sought to limit the allocation of resources mandated by litigation by requesting spending caps (Jesup 2013; GAO 2017). In 1998, Congress converted the budget allocation for the listing program into a statutory mandate (the listing cap) to prevent reallocation of funds from other programs to the listing program. In 2002 the amount of the listing budget that can be spent on critical habitat designation was limited (the critical habitat subcap), and in 2012 a limit was placed on petition- and foreign species listing-related expenditures (the petition and foreign listings subcaps).

### *Literature*

This paper contributes to four strands of literature. First, a large literature in economics examines how private interest groups affect governmental agencies' decision-making. Early theoretical work concluded that interest group lobbying influences regulatory agencies (Stigler 1971; Peltzman 1976; Becker 1983). More recent research has modeled agencies as choosing regulatory policy to maximize positive feedback (Olson 1996) or minimize criticism from interest groups (Leaver 2009).

There is empirical evidence of interest group influence in a variety of regulatory contexts, including the Federal Drug Administration (Olson 1996), banking (Kroszner and Strahan 1999), electricity (Knittel 2006), and public utility commissions (Leaver 2009). A subset of this literature examines the impact of interest groups on environmental regulation. These papers have found evidence of environmental group impacts on U.S. Environmental Protection Agency decisions (Cropper et al. 1992; Sigman 2001) and federal dam relicensing (Kosnick 2005; 2010). This paper contributes to this literature by focusing on litigation in the context of the ESA. The only other study that addresses the ESA is Ando (1999), which finds that interest groups influence the rate at which FWS lists species. While Ando (1999)

measures interest group pressure using petition or comment submissions and hearing requests, this paper examines the impact of action-forcing litigation, which has not been assessed before.

Second, there is a rich literature on the economics of the ESA, which is reviewed in Brown and Shogren (1998) and Langpap et al. (2018). A subset of this literature examines the factors that drive FWS' listing and implementation decisions (Metrick and Weitzman 1996; 1998; Dawson and Shogren 2001), and finds evidence that non-scientific factors, such as size and taxonomy of a species, its long-term cultural value, and historical use play a substantial role in listing and expenditure decisions. This paper contributes to this literature by examining the role of citizen litigation on ESA implementation decisions, which was not one of the factors assessed in these papers.

Third, there is a growing literature in economics that examines the role of environmental groups in implementation of environmental regulations and the impact of these groups on environmental quality. Empirical work in the context of the Clean Water Act has found evidence that citizen suits crowd in agency monitoring but crowd out sanctions (Langpap and Shimshack 2010), and that the presence of environmental groups reduces inspections but increases compliance (Grant and Grooms 2017). There is also evidence that environmental group presence and expenditures increase water quality in a watershed (Grant and Langpap 2019). None of these studies examined the effect of action-forcing litigation, which is a more direct way for pressure groups to affect agency decisions, and thus could have different impacts. This paper contributes to this literature by extending the work on citizen suits to action-forcing litigation and by its focus on the ESA.

Finally, there is a broader conservation law and policy literature that explicitly focuses on citizen suits under the ESA. Part of this literature is supportive of litigation,

finding that lawsuits are important in selecting species in need of protection and reducing listing delays (Greenwald et al. 2006; Brosi and Biber 2010; 2012; Puckett et al. 2016). None of these papers addresses potential bias caused by omitted variables, such as species status, or by possible sample selection created by focusing only on listed species.

Others note that litigation may undermine FWS' ability to set its agenda and create negative spillovers on ESA implementation for other species. When ruling on a case, a court considers only the issue in front of it (e.g. listing) and assumes the agency should spend its available resources on that issue. Given limited resources, this can result in the courts and plaintiffs largely dictating FWS' priorities. The agency may also have to direct a significant portion of its resources to manage a large litigation workload rather than to implement its Section 4 program (Patlis 2003; Jesup 2013). Indeed, in November 2000 FWS temporarily shut down the listing program to address court orders requiring critical habitat designation. Furthermore, an analysis by the U.S. Government Accountability Office (2017) finds that FWS delayed completing Section 4 actions to complete those included in settlements and court orders. Alternatively, higher litigation activity levels could spur ESA implementation actions if FWS wants to avoid further litigation. While these papers raise the possibility that litigation could have negative spillovers on ESA implementation for other species, they do not test this hypothesis empirically.

There are also questions about whether citizen litigation is effective and has a causal impact on listings. Figure 2 shows trends in yearly listing lawsuits and species listings. During the study period, an average of 23 species were listed per year, and an average of ten lawsuits seeking listing were filed per year. No relationship is apparent during the 1990s, when there are few lawsuits. As the number of lawsuits increases starting roughly in the year 2000, a

correlation becomes more apparent, likely with a lag given the length of legal proceedings.<sup>6</sup> However, this does not imply a causal effect. While litigation is generally successful (Bevington 2009), FWS has defended its refusal to list a species in several occasions (Biber and Brosi 2010). Furthermore, Jesup (2013) notes that research concluding that litigation drives listings may be mistaking correlation for causation. These questions cannot be resolved without a rigorous causal identification strategy.

This paper adds to this literature by carrying out an empirical analysis that recognizes and addresses the potential for endogeneity and providing plausible estimates of causal effects of litigation. It also contributes to this literature by examining the impact of citizen lawsuits not only on FWS listing decisions, but also on critical habitat designation and recovery expenditures. Furthermore, it is the first to empirically test for the presence of spillovers in ESA implementation caused by litigation. Finally, it expands the scope of existing work by including all species (vertebrates) rather than just listed species.

### III. Data and Estimation

I estimate the following regression model to assess the effect of citizen lawsuits on ESA implementation:

$$y_{it} = \beta_0 + \beta_1 \ln \text{Own Lawsuits}_{it} + \beta_2 \ln \text{Other Lawsuits}_{it} + \mathbf{X}_{it}\boldsymbol{\beta}_3 + \alpha_i + \tau_t + \boldsymbol{\gamma}_t + \varepsilon_{it} \quad (1)$$

The outcome  $y_{it}$  represents four separate measures of ESA implementation: whether species  $i$  is listed in year  $t$ , whether it has critical habitat designated, the size of its critical habitat, and total recovery expenditures on the species during that year.

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<sup>6</sup> The spike in listing cases in 2010 may have resulted from a combination of a “mega-petition” for listing of 404 species filed in April of that year, the accompanying 90-day initial review requirements, and the resulting reduced emphasis on ongoing work on proposed listing rules for warranted-but-precluded species.

The effect of litigation targeting a species is measured by *Own Lawsuits<sub>it</sub>*, the cumulative number of lawsuits filed to compel FWS to carry out a specific administrative action for species  $i$  by year  $t$ . For example, when the outcome is listing, *Own Lawsuits<sub>it</sub>* gives the cumulative lawsuits filed to induce listing of species  $i$ . It is important to use cumulative lawsuits because, as noted above, it is not uncommon for an action to be litigated repeatedly before a final resolution is reached.

Spillovers are captured by *Other Lawsuits<sub>it</sub>*, the cumulative number of lawsuits filed on behalf of other species in species  $i$ 's lead FWS administrative region by year  $t$ . This variable measures the effect of the workload from litigation for other species on ESA implementation for species  $i$ . I use other lawsuits within a species' administrative region because that is the relevant spatial scale for ESA implementation for that species. In this case, it is important to use cumulative litigation because lawsuits are rarely resolved in the year when they are filed, causing the workload to accumulate over time. I use the total number of other lawsuits over the preceding three years.<sup>7</sup>

The matrix  $\mathbf{X}_{it}$  contains characteristics of the states within the species' range: population growth, population density, and political inclination (percent of vote for the republican candidate in the most recent senate election). Finally, the model includes species fixed effects,  $\alpha_i$ , year fixed effects,  $\tau_t$ , and dummy variables for the years in which the relevant spending caps are in effect,  $\gamma_t$ , while  $\varepsilon_{it}$  is an idiosyncratic error term. I explore an alternative fixed effects structure in the sensitivity section.

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<sup>7</sup> There are no data that indicate precisely how long it takes ESA litigation to work its way through the courts, but a review of recent cases of a frequent plaintiff group suggests between two and six years (see <https://wildearthguardians.org/legal-cases/>). The finding of no negative spillovers is robust to alternative accumulation periods (4, 5, 6 years), but positive spillovers on critical habitat are not.

ESA implementation and litigation decisions may be affected by common shocks within administrative regions and regional administrative court systems. Hence, standard errors are clustered at the administrative region level. Given there are only nine administrative regions, the number of clusters is small and standard errors may be underestimated. Therefore, I use a wild-bootstrap-t-method to conduct inference while adjusting for the low number of clusters. This method is based on generating many bootstrap samples that resemble the actual sample (here I use 999), calculating the  $t$  – statistic for each, and establishing how extreme the original  $t$  – statistic is by comparing it with the distribution of the bootstrapped statistics. This procedure does not generate standard errors, so inference is instead based on  $p$  - values (Cameron et al. 2008; Cameron and Miller 2015; Roodman et al. 2019).

#### *Data*

FWS is charged with management of terrestrial species and non-marine fish, whereas the National Marine Fisheries service oversees marine species. Because ESA implementation is different for the latter species, and given that the majority of lawsuits have been filed in response to FWS' decisions, I focus on implementation by FWS. I obtained a list of U.S. terrestrial vertebrates and non-marine fish and their characteristics, including range, from the International Union for Conservation of Nature using the Red List API (IUCN 2019). Additional species characteristics come from NatureServe Explorer ([www.explorer.natureserve.org](http://www.explorer.natureserve.org)). ESA implementation data come from recovery reports (FWS 1990 – 2016 a). FWS determines lead administrative region based on where the majority of habitat for a species is located.<sup>8</sup> I use the same rule to designate lead region for species that are not listed. I obtained expenditures on species recovery from annual reports

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<sup>8</sup> Personal communication with FWS staff.

(FWS 1990 – 2016 b). Expenditures are adjusted for inflation using the Consumer Price Index. State-level data on election results are from the CQ Press Voting and Elections Collection (<http://library.cqpress.com/elections/index.php>). I interpolate for years in which there were no Senate races. Data on population growth and density are from the US Census Bureau (<https://www.census.gov/programs-surveys/popest.html>).

I obtained litigation data through a Freedom of Information Act request. FWS provided .pdf copies of ESA - related complaints filed against the agency from 2000 to 2016. The complaints include information on the plaintiff, the reasons for the lawsuit, the species targeted, the federal district court where the lawsuit was filed, and the filing date. I obtained additional litigation data for 1990 to 1999 from the Lexis-Nexis database.

I construct a panel data set of species-level observations for the years 1990 – 2016. These data are available for 2,518 species. This is the sample available to estimate model (1) when the outcome is listing. Only listed species are eligible for critical habitat designation and recovery expenditures. Hence, when these are the outcomes, I estimate model (1) for 116 listed species. Table A1 in the online appendix shows summary statistics for implementation, litigation, and selected species characteristics.

#### *Estimation – Listing*

An important concern for identifying the causal impact of litigation in model (1) is the potential endogeneity caused by omitted variables. Despite the use of species-level fixed effects, there may be unobserved time-variant characteristics that affect ESA implementation and are correlated with the likelihood that a species is targeted in a lawsuit. For instance, a species' endangerment status is a factor in the listing decision, and likely also informs

environmental groups' litigation choices, which means it is correlated with *Own Lawsuits<sub>it</sub>*.<sup>9</sup> This, or other omitted species characteristics, however, are not correlated with the spillover variable *Other Lawsuits<sub>it</sub>*, because it contains litigation on behalf of other species.

I address this endogeneity concern using instrumental variables. I follow previous work on citizen suits and instrument for *Own Lawsuits<sub>it</sub>* using two federal district court characteristics: judicial temperament and judicial caseload (Langpap and Shimshack 2010). Citizen lawsuits are processed in federal district courts, and environmental group plaintiffs are less likely to file a claim if they expect the district court where the suit would be tried to be hostile to their case. Additionally, these groups are less inclined to pursue a case if they believe that the lawsuit, and thus their limited litigation resources, may be tied up in court for a long time. These court characteristics are therefore likely relevant instruments, and I verify later that there is a conditional relationship between own lawsuits and the instruments. Court characteristics are also plausibly exogenous because ESA implementation is an administrative decision made by FWS at the national and regional level, and hence completely independent of federal district courts. Indeed, the only link between ESA implementation and the court system is through citizen litigation. Additionally, ESA- related lawsuits represent only a small portion of litigation handled by district courts.<sup>10</sup> Hence, the instruments should satisfy exclusion restrictions for model (1).

The first instrument measures the judicial preferences of district court judges in a given district and year. Drawing from the political science literature, each judge is assigned a political ideology score based on the ideology scores of the appointing U.S. President and

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<sup>9</sup> It is not possible to explicitly control for endangerment status because this information is only available systematically for listed species. While IUCN evaluates status for most species, it does not do so on a regular basis. Estimation sample size decreases from 67,986 to 7,105 if the model is estimated including IUCN status.

<sup>10</sup> In the two years with the largest number of ESA cases, 58 in 2009 and 55 in 2010, the total number of filings in all district courts were 363,774 and 372,673, respectively.

the U.S. senators from the state where the court is located. I use scores calculated by Boyd (2015), who uses the methodology established in Giles et al. (2001) and Epstein et al. (2007).<sup>11</sup> Scores of appointing elected officials have been consistently linked to federal judges' behavior and are highly correlated with the idiosyncratic preferences of judges in a district court in a given year (Lyles 1996; Pinello 1999). The scores are scaled from -1 for most liberal to +1 for most conservative.

To construct the instrument, I calculate the mean ideology score for all district judges in species *i*'s lead FWS administrative region for each year in the study period. Figure A2a in the online appendix shows variation in this instrument over time for each region. Scores are based on political factors at the time of appointment, and judges are federally appointed for life terms. Hence, the instrument does not reflect region-level political preferences over the study period. Cases are generally assigned to judges on a rotational or random basis. More conservative court-year combinations have higher scores and more liberal court-year combinations have lower scores. Therefore, I expect ideology scores to have a negative effect on the likelihood of citizen litigation. Figure 3a suggests that more cases tend to be filed in relatively more liberal courts.

The second instrument measures the percentage of “old” cases in each district court, defined as those pending for at least three years. To construct the instrument, I use federal court management statistics data from the Administrative Office of the U.S. Courts (<http://www.uscourts.gov/statistics-reports/analysis-reports/federal-court-management-statistics>) to calculate the mean percentage of old cases for all district courts in species *i*'s

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<sup>11</sup> The scores place presidents and senators on a metric that is common across time and institutions and are hence known as Common Space scores. Giles et al. (2001) subject this measure to convergent and construction validation and find that it is highly correlated to the party of the appointing president, a conventional measure of judicial temperament. Further, the scores are significantly related to liberal/conservative voting by judges and more completely explain judicial voting than the presidential party metric.

lead administrative region for each year. Figure A2b in the online appendix shows variation in this instrument over time for each region. Given that ESA litigation represents a small portion of federal courts' caseloads, percentage of old cases is plausibly exogenous. Busier courts have a larger backlog of unresolved cases. Because slow moving courts increase plaintiffs' opportunity costs, the percentage of old cases in a district court should be negatively correlated with citizen lawsuits. Figure 3b suggests that more cases are filed in courts with smaller proportions of cases pending for three or more years. Therefore, I expect this instrument to have a negative effect on the likelihood of citizen litigation.

When the dependent variable is listing status, I estimate model (1) using two-stage least squares (2SLS). Figure 3 suggests a non-linear relationship between own lawsuits and the instruments, so the first stage is specified as

$$\ln Own\ Lawsuits_{it} = \gamma_0 + \gamma_1 \ln Ideology\ Score_{it} + \gamma_2 \ln Old\ Lawsuits_{it} + \mathbf{X}_{it}\boldsymbol{\gamma}_3 + \alpha_i + \tau_t + \boldsymbol{\gamma}_t + u_{it} \quad (2)$$

Results are robust to using second-degree polynomials of the instruments instead of the logarithm. Summary statistics for the instruments are in Table A1.

#### *Estimation – Critical Habitat and Expenditures*

Only listed species are eligible for critical habitat designation and expenditures to promote recovery. Hence, for either of these dependent variables, model (1) can only be estimated for listed species. For this subsample, the instruments used for identification in the listing model are inadequate.<sup>12</sup> Therefore, I use an alternative identification strategy and follow a growing number of studies that combine matching and fixed effects estimation (Arriagada et al. 2012; Alix-Garcia et al. 2015; Jones and Lewis 2015; Grant and Langpap 2019). Estimates and

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<sup>12</sup> The instruments do not have a statistically significant effect on the litigation variable that includes post-listing lawsuits. The instruments are relevant when this litigation variable is used to estimate the listing model, which suggests that the lack of relevance is due to the smaller sample, not the instruments themselves.

inferences from this combination have been shown to replicate those in a randomized trial (Ferraro and Miranda 2017).

To carry out the matching procedure, I define treated observations as listed species targeted in a lawsuit filed by environmental groups.<sup>13</sup> This treatment is also appropriate for expenditures, given that any post-listing litigation could affect expenditures on a species. I assess robustness to the definition of treatment in the Sensitivity section.

I define treatment starting in 1991 and pre-process the data to make treated and control species observationally similar prior to treatment by matching in terms of selected time-invariant or pre-treatment (1990) species characteristics and on FWS-determined recovery status. Additionally, I match on a species' lead administrative region to control for region-level characteristics that impact ESA implementation. Importantly, I also match on the relevant outcome (critical habitat designation or expenditures) for 1990. This addresses the concern that species lacking critical habitat or receiving less funding might be more likely to be targeted in lawsuits, since treated and control species used in the estimation sample have similar outcomes at the beginning of the study period. I match using Mahalanobis covariate matching with four nearest neighbors and no caliper. This process yields balanced samples, which I then use to estimate model (1) for each of the three outcomes.

#### **IV. Results**

In this section, I present estimation results for each of the four outcomes. First, I discuss 2SLS results for the listing model, and then matching-plus-fixed effects results for critical habitat designation and expenditures.

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<sup>13</sup> The vast majority of non-listing lawsuits are filed to compel critical habitat designation or revise the size of critical habitat.

### *Listing: First Stage – Determinants of Citizen Lawsuits*

Table 2 provides results for the first-stage regression. Both instruments are statistically significant and have the expected sign. The estimated coefficients confirm that, on average, environmental groups file fewer listing lawsuits in courts that are busier and have judges that are more conservative. Given clustered standard errors, I report the Kleibergen-Paap Wald  $F$  – statistic to assess weakness of the instruments. The statistic (32.37) suggests the instruments are sufficiently relevant to mitigate weakness concerns. Finally, I report the Sargan-Jansen  $J$  – statistic for a test of overidentifying restrictions. The statistic indicates that I cannot reject the null hypothesis of exogenous instruments.

### *Listing: Second Stage – Effects of Litigation*

Table 3 shows second-stage results. I also present results without instrumenting for *Own Lawsuits* as reference. The coefficient on *Own Lawsuits* is positive and significant, suggesting that listing lawsuits have a positive impact on the likelihood of listing in that year. The coefficient on *Other Lawsuits*, in contrast, is not significant, suggesting that there are no spillovers from litigation on behalf of other species.

Given that this is a level-log model for the litigation variables, the estimated coefficient implies that, on average, a 1% increase in cumulative own lawsuits increases the probability that a species is listed by 0.00326 in a given year. However, a 1% increase in lawsuits is not a representative change. To get a sense of the magnitude of the effects of litigation, I look at empirically relevant changes in number of lawsuits from two alternative perspectives. First, I consider the average increase in litigation over the study period. Between 1990 and 2016, own lawsuits increased 34% per year, which causes an increase in the probability of listing of 0.11. This represents a 118% increase in the probability of listing for the average species. Alternatively, I calculate the short-term change in probability of

listing induced by a single lawsuit targeting a species with no prior litigation. This can be interpreted as the payoff to an environmental group of filing that lawsuit. Given that there are 21 citizen suits per year on average, one additional lawsuit represents a 5% increase. The estimated coefficient for *Own Lawsuits* implies that the probability of listing would increase by roughly 0.02. For species with no previous litigation, the average probability of listing goes up from approximately 9% to 11%, or an 18% increase.

These results suggest that, for the average species targeted in a listing lawsuit, litigation on its behalf has a positive effect on the likelihood of listing. In contrast, lawsuits on behalf of other species do not have an impact on the likelihood of listing for the average species.

An important caveat to these results should be noted. Most lawsuits are resolved through settlement (FAO 2017), which suggests that in some instances settlements or court orders may simply codify what would have happened without a lawsuit (Jesup 2013). These results cannot shed light on whether species targeted by citizen suits may have been listed anyway in the absence of litigation.

#### *Critical Habitat and Expenditures: Effects of Litigation*

The results of the matching procedure are presented in table A2 in the online appendix. I assess the effectiveness of matching by calculating the standardized difference in means (for 1990) between treated and control species for each covariate and each outcome. A standardized difference above 0.25 can cause bias in regression estimates (Imbens and Wooldridge 2009). Before matching, the sample was unbalanced across several covariates, including the outcome variables, with standardized differences exceeding 0.25. Litigated species were less likely to have critical habitat designated and had higher expenditures. After

matching, all standardized differences are 0.25 or less.<sup>14</sup> This indicates that the matching procedure successfully breaks any pre-estimation links between outcomes and litigation, thereby mitigating endogeneity concerns. The sample is also balanced in terms of pre-treatment recovery status.

I use the balanced sample to estimate model (1) with critical habitat designation, size (acreage) of critical habitat, and recovery expenditures as dependent variables. I report results in Table 4.

Lawsuits targeting a species have a positive effect on the likelihood that the species has critical habitat designated. The estimated coefficient indicates that a 1% increase in cumulative lawsuits increases the probability of critical habitat designation by 0.00178. Over the study period, cumulative lawsuits by environmental groups increase by 14% per year on average, which corresponds to an increase in the probability of critical habitat designation of 0.025. This represents a 10.3% increase for the average species. Alternatively, I measure the effect of a single lawsuit for a species that has not been targeted by litigation before. An additional lawsuit represent a 5% change in litigation on average. Hence, for such a species the probability of critical habitat designation goes up from 20% to 21%, or a 4% increase.

Lawsuits also increase the size of critical habitat. A 1% increase in cumulative lawsuits increases critical habitat size by 2.01%, and the average 14% yearly growth in cumulative litigation causes an increase of 28.11% in critical habitat acreage. A single lawsuit targeting a species without previous litigation increases critical habitat acreage by 10%, or roughly 5,500 acres.

Finally, litigation targeting a species increases expenditures on that species. A 1% increase in own lawsuits increases expenditures by 0.27%, and the average 14% yearly

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<sup>14</sup> Even in cases where the matching procedure increased the standardized difference, it remained below 0.25.

increase in lawsuits raises expenditures by 3.7%. A species without previous lawsuits filed on its behalf is allocated an additional \$18,000 following a first lawsuit.

The results also suggest that there may be positive spillovers of litigation on behalf of other species on critical habitat designation and size. A 1% increase in cumulative other lawsuits increases the probability of critical habitat designation by 0.00003 and critical habitat size by 0.06%. Other lawsuits go up by 12% per year on average, which corresponds to a 0.00036 increase in the probability of critical habitat designation (a 0.15% increase for the average species), and a 0.72% increase in critical habitat size. Hence, positive spillover effects on critical habitat are small in magnitude. Additionally, there are no spillover effects on recovery expenditures.

## **V. Sensitivity**

In this section, I assess the sensitivity of these results to identification challenges and changes in model specification. First, I check the robustness of results for listing, and then those for critical habitat and expenditures.

### *Listing: Sensitivity to Potential Violations of Exclusion Restrictions*

It is possible that omitted variables are correlated with the instruments and hence that exclusion restrictions are not met exactly. While it is not possible to quantify or sign the potential resulting bias, I believe that the magnitude of this bias may be small on average. As noted in Table 2, the Sargan test fails to reject the null hypothesis of uncorrelated residuals and instruments. Additionally, I conduct two falsification (placebo) exercises. The first is a temporal falsification test. I split the sample into two parts, and use instruments for 2004 – 2016 in a model for 1990 – 2002. If the effects identified using instrumental variables are truly causal, they should hold only for the relevant period. That is, current instrumented

lawsuits should not have an impact on listings in previous years. The second falsification test uses lawsuits filed to compel administrative actions other than listing (mostly critical habitat designation or revision). If the effects of listing litigation on listing decisions are truly causal, they should not hold for lawsuits that do not compel listing. If I did find effects on previous listings or from other types of litigation, it would suggest that the main results might reflect correlation with time-varying unobservable factors, trends, or shocks that are also correlated with listing decisions, or it may indicate that the results are spurious rather than causal. I present results for the falsification tests in Table 5. The estimated coefficients for instrumented 2004 – 2016 listing lawsuits and instrumented lawsuits for reasons other than listing are not statistically significant. These results suggest that the estimated effects are not merely spurious or reflecting correlation with time-varying unobserved factors affecting listing.

#### *Listing: Sensitivity to Fixed Effects Specifications*

The preferred specification uses species-level fixed effects. As an alternative, I estimate a model with lead administrative region fixed effects, because that is the relevant scale for ESA implementation decisions at the species level. In lieu of species fixed effects, this specification includes several time-invariant species characteristics: taxonomic category, body size, distinctiveness (whether the species belongs to a monotypic or small genus), dietary habits, and types of habitat. Finally, the specification includes fixed effects for the states in the species' range. To the extent that geographic or ecosystem factors that drive species decline tend to change slowly over time, this specification can help control for any ecosystem considerations that compel group listing decisions on a geographic basis. I present results in Table A3 in the online appendix. The estimates are qualitatively and quantitatively similar to those in the main specification.

### *Critical Habitat and Expenditures: Sensitivity to Omitted Covariates*

It is possible that time-variant unobservable factors that affect critical habitat or expenditures are not accounted for. To assess the extent to which omitted factors may introduce bias, I conduct a test suggested by Oster (2019). The test assesses the effect of omitting observed covariates on coefficient stability and changes in  $R^2$ . The procedure yields a test statistic ( $\delta$ ) for how important the omitted unobservables would have to be relative to the observables in explaining the outcome to eliminate the observed effect (the degree of selection on unobservables relative to observables). I conduct the test by estimating the model without conditioning on population growth, population density, and republican vote, the time-variant controls in the model. I show the  $\delta$  – statistics in Table A4. The  $\delta$  – statistics suggest that omitted time-variant factors would have to be 17.35, 4.33, and 2.96 times as important as included covariates to reduce the measured effect of *Own Lawsuits* on critical habitat designation, size, and recovery expenditures, respectively, to zero. Omitted factors would have to be 3.26 and 28.23 times as important as included covariates to reduce the effect of *Other Lawsuits* on critical habitat designation and size to zero. The suggested lower bound is  $\delta = 1$ .

### *Critical Habitat and Expenditures: Sensitivity to Alternative Treatment*

In the main model, treated species are those targeted in lawsuits compelling actions other than listing (e.g. critical habitat), since only listed species are eligible for critical habitat designation and recovery expenditures. I assess the robustness of the results to defining treatment as being targeted in any lawsuit filed by environmental groups, including listing lawsuits. I present estimates in Table A5 in the online appendix. With the exception of the effect of litigation on expenditures, which is not statistically significant, results are consistent with those from the main models.

### *Critical Habitat and Expenditures: Sensitivity to Fixed Effects Specifications*

Finally, as with the listing model, I check for sensitivity to a model with lead administrative region fixed effects, species characteristics, and fixed effects for the states in the species' range. I present estimates in Table A6 in the online appendix. Results are generally consistent with those from the preferred specifications, with one exception: other lawsuits have no effect on critical habitat designation.

## **VI. Discussion**

Advocates of action-forcing lawsuits filed against FWS argue that they are an invaluable tool to compel ESA implementation, which would otherwise be delayed or not take place at all. In contrast, critics are skeptical that citizen suits actually drive agency decisions, and argue that lawsuits may have detrimental effects by limiting FWS discretion and diverting agency resources to litigation. The results in this paper support the former argument, but not the latter. Species targeted in lawsuits are more likely to be listed as endangered or threatened and, as importantly, there do not appear to be negative spillovers on the listing process associated with the overall level of litigation activity. Furthermore, the magnitude of the positive effect of litigation is meaningful.

Litigation also has positive impacts on other ESA implementation actions. Listed species targeted in lawsuits are more likely to have critical habitat designated, have significantly larger critical habitat, and receive meaningfully more recovery funds. Furthermore, there is no evidence of negative spillovers for these aspects of ESA implementation either. Litigation on behalf of other species does not affect expenditures on that species, and there may be some positive spillovers on critical habitat designation and size, although these effects are small and not as robust.

The results suggesting no negative spillovers are somewhat surprising, particularly regarding allocation of funds. They may reflect the effects of the spending caps requested by FWS. The caps imply that litigation to compel listing would not impact resources for recovery of listed species (Biber and Brosi 2010), which is what the results indicate. Additionally, the listing budget increased dramatically during the 2000s, because the Bush administration preferred to seek budget increases rather than risk contempt-of-court proceedings (Jesup 2013). This could also have mitigated potential impacts on expenditures. Finally, it is worth noting that the cost of litigation itself does not come out of FWS' budget, but rather from the Department of Justice, which pays attorneys' fees out of a specific fund for this purpose (Puckett et al. 2016). The small positive spillovers may arise from litigation activity creating incentives for FWS to attempt to preempt further lawsuits related to critical habitat.

What do these results imply about the potential effect of litigation on species recovery? While this question is beyond the scope of this paper given its focus on ESA implementation, it is possible to make a very rough back-of-the-envelope calculation based on existing estimates of effects of listing on recovery. The mean treatment effect of listing and expenditures on recovery score estimated by Ferraro et al. (2007) is 0.43. Given the estimated impact of litigation of a 118% increase in the probability of listing for the average species, this suggests that the expected effect of litigation on recovery status is  $1.18 \times 0.43 = 0.51$ . That is, the recovery status for the average species targeted in a lawsuit in my sample would increase from 2.43 to 2.94, or roughly from Endangered to Vulnerable. Hence, the findings presented here suggest that citizen lawsuits likely have a positive impact on recovery. From this perspective, the results do not support reducing or eliminating citizen lawsuits under the ESA.

While the results in this paper suggest that litigation is effective in promoting ESA implementation, they do not yield any conclusions about the efficiency of this type of pressure group intervention. Litigation can be costly and time consuming. Furthermore, we cannot observe a counterfactual on the set of species that would have been listed, assigned critical habitat, or received recovery expenditures in the absence of litigation, or the value of the corresponding social and ecosystem benefits. Nevertheless, a simple back-of-the-envelope analysis can provide some sense of orders of magnitude of benefits relative to costs, and hence shed some light on the efficiency of action-forcing litigation in the context of the ESA (details are provided in the online appendix).

There are multiple estimates of willingness to pay (WTP) for avoiding loss of species (see the meta analysis by Richardson and Loomis 2009), which can be interpreted as being achieved through listing (only ten of more than 2,400 species have become extinct while listed). One of the lowest estimated WTP is \$12.69 per household per year (in 2019 dollars) to avoid loss of Atlantic salmon. Conservatively counting only households in the survey sample used to generate this estimate (households in Massachusetts) rather than in the entire range of the species, and furthermore only counting the fraction of these households corresponding to the survey response rate (30%), yields an estimated yearly benefit of avoiding loss (listing) this species of \$10.09 million. Further scaling this number down to account for the fact that one lawsuit increases the probability of listing by 18%, I arrive at an annual benefit of litigation to list the species of \$1.82 million.<sup>15</sup> There are no estimates of the cost of litigation, but publicly available information on program expenditures and number of lawsuits filed between 2017 and 2019 by a large environmental nonprofit involved in

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<sup>15</sup> A lawsuit to compel listing of the Atlantic Salmon was filed in 1995. The species was listed in 2009.

litigation allows me to estimate the average cost of a lawsuit at \$170,089.<sup>16</sup> Doubling this amount to account for costs to both plaintiff and defendant yields \$340,178, which is lower than the estimated benefits. While one should be cautious about drawing broad conclusions from these simple calculations, they suggest litigation may be an efficient way to ensure ESA protection for imperiled species.

## **VII. Summary and Conclusions**

This paper uses a comprehensive dataset on ESA litigation to assess the impact of citizen lawsuits on implementation of the Act. Causal identification relies on instrumental variables and on a combination of matching and fixed effects. Results indicate that listing lawsuits have a positive effect on the likelihood that species are listed, and that there are no negative spillovers of litigation on behalf of other species. Results also suggest that lawsuits have a positive effect on critical habitat designation and size, as well as on recovery expenditures, without negative spillovers for these implementation actions, and some small positive spillover impacts on critical habitat. Furthermore, the size of these effects is meaningful: given the average yearly increase in litigation, the probability of listing for a given species increases by 118%, the probability of critical habitat designation increases by 10%, while critical habitat size goes up by 28%, and recovery expenditures allocated to a species rise by 3.7%.

Given evidence of positive impacts of listing and public expenditures on species recovery, the results indicate that litigation, by eliciting these administrative actions from FWS, likely has a positive impact on recovery as well. Finally, simple estimates of costs and benefits suggest litigation may be an efficient way to ensure ESA protection for imperiled

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<sup>16</sup> <https://www.biologicaldiversity.org/index.html>

species. Hence, these results do not offer support for policies aimed at reducing the role of the private sector, specifically through environmental group lawsuits, on ESA implementation.

**Table 1 – Lawsuits by Year and US Fish & Wildlife Service Administrative Region**

Year	Total Lawsuits	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	R 9
1990	1	1	0	0	0	0	0	0	0	0
1991	7	2	1	0	1	0	2	0	1	0
1992	5	3	0	0	1	0	1	0	0	0
1993	10	4	0	0	0	0	4	0	2	0
1994	9	1	4	1	1	0	2	0	0	0
1995	5	1	0	2	0	1	0	0	1	0
1996	7	1	4	0	0	0	1	1	0	0
1997	6	3	3	0	0	0	0	0	0	0
1998	9	2	4	0	0	0	1	1	1	0
1999	12	4	8	0	0	0	0	0	0	0
2000	16	3	2	0	2	1	4	0	4	0
2001	17	4	2	1	1	0	3	0	6	0
2002	11	5	3	0	1	0	2	0	0	0
2003	30	6	2	3	4	3	5	1	4	1
2004	30	8	2	5	1	1	8	0	8	0
2005	33	9	5	4	3	0	7	0	5	0
2006	35	8	8	4	2	2	7	0	3	1
2007	38	6	7	3	6	0	11	1	4	0
2008	47	11	6	4	3	1	10	7	5	0
2009	58	16	11	1	3	4	14	1	6	2
2010	55	9	19	2	3	0	17	0	3	3
2011	22	5	1	2	1	0	3	4	2	4
2012	25	5	5	0	3	1	5	0	4	2
2013	25	8	2	1	4	0	5	0	4	1
2014	24	6	7	1	1	0	7	0	2	9
2015	21	3	6	1	3	0	6	0	0	2
2016	7	2	0	1	1	0	1	0	1	1
Total	565	136	112	36	45	14	126	16	66	26
Avg.	20.93	5.04	4.15	1.33	1.67	0.52	4.67	0.59	2.44	0.96

**Table 2 – First Stage Regression: Determinants of Own Lawsuits**

Explanatory Variables	Dependent Variable: ln of Cumulative Own Lawsuits
ln Mean Judicial Ideology Score	-0.448 <sup>***</sup> (0.000)
ln Mean Number of Old Cases	-0.049 <sup>***</sup> (0.000)
ln Cumulative Other Lawsuits	-9.84E-05 (0.971)
Mean Population Growth	-0.243 <sup>**</sup> (0.031)
Mean Population Density	-2.47E-04 <sup>**</sup> (0.024)
Mean Republican Vote	0.031 (0.247)
Species Fixed Effects	Yes
Year Fixed Effects	Yes
Spending Cap Dummy Variables	Yes
Observations	67,986
Kleibergen-Paap Wald rk $F$ - Statistic	32.37
Prob > $F$	0.0001
Sargan-Hansen $J$ - Statistic	0.362
Prob > $\chi^2$	0.5473

Administrative Region-level cluster - robust standard errors.

$p$  - values in parentheses.

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

**Table 3 – No-Instruments and Second Stage Regressions:  
Effects of Litigation on Listing**

Explanatory Variables	Dependent Variable: Listing	
	No IV	2SLS
In Cumulative Own Lawsuits	0.140*** (0.0000)	0.326** (0.0300)
In Cumulative Other Lawsuits	-9.85E-04 (0.7848)	-0.002 (0.5786)
Mean Population Growth	-0.121 (0.6226)	-0.055 (0.8869)
Mean Population Density	-0.55E-04 (0.5626)	-4.10E-06 (0.9690)
Mean Republican Vote	-0.023 (0.3864)	-0.023 (0.4424)
Species Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes
Spending Cap Dummy Variables	Yes	Yes
Observations	67,986	67,986

Administrative Region-level cluster - robust standard errors.

$p$  - values in parentheses.

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

**Table 4 – Effects of Litigation on Critical Habitat and Expenditures**

Explanatory Variables	Dependent Variable:		
	Critical Habitat Designation	ln Critical Habitat Size	ln Expenditures
ln Cumulative Own Lawsuits	0.178** (0.0178)	2.008** (0.0305)	0.265** (0.0020)
ln Cumulative Other Lawsuits	0.003*** (0.0000)	0.063*** (0.0000)	0.014 (0.6847)
Mean Population Growth	-0.257 (0.8433)	0.598 (0.9650)	-0.487 (0.6947)
Mean Population Density	-0.002*** (0.0000)	-0.017** (0.0118)	0.003 (0.4444)
Mean Republican Vote	0.031 (0.8932)	-0.255 (0.9073)	-0.060 (0.6166)
Species Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
Spending Cap Dummy Variables	Yes	Yes	Yes
Observations	3,016	3,016	3,172

Administrative Region-level cluster - robust standard errors.

*p* - values in parentheses.

\*\*\* *p* < 0.01, \*\* *p* < 0.05, \* *p* < 0.1.

**Table 5 – Sensitivity for Listing Model: Falsification Tests**

Explanatory Variables	Dep. Variable: Listing 1990 - 2003	Dep. Variable: Listing 1990 - 2016
In Cumulative Own Lawsuits 2004 - 2016	8.091 (0.4905)	
In Cumulative Own Lawsuits – Not for Listing		0.930 (0.3243)
In Cumulative Other Lawsuits	-0.011 (0.3844)	2.37E-04 (0.9830)
Mean Population Growth	-0.710 (0.7107)	0.178* (0.0681)
Mean Population Density	0.17E-04 (0.8789)	-0.1E-04 (0.8669)
Mean Republican Vote	0.095 (0.9850)	-0.018 (0.3363)
Species Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes
Spending Cap Dummy Variables	Yes	Yes
Observations	32,734	67,986
Kleibergen-Paap Wald rk $F$ - Statistic	0.07	1.49
Prob > $F$	0.9337	0.2821

Administrative Region-level cluster - robust standard errors.

$p$  - values in parentheses.

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

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Figure 1. ESA Implementation and Litigation – Timeline and Deadlines

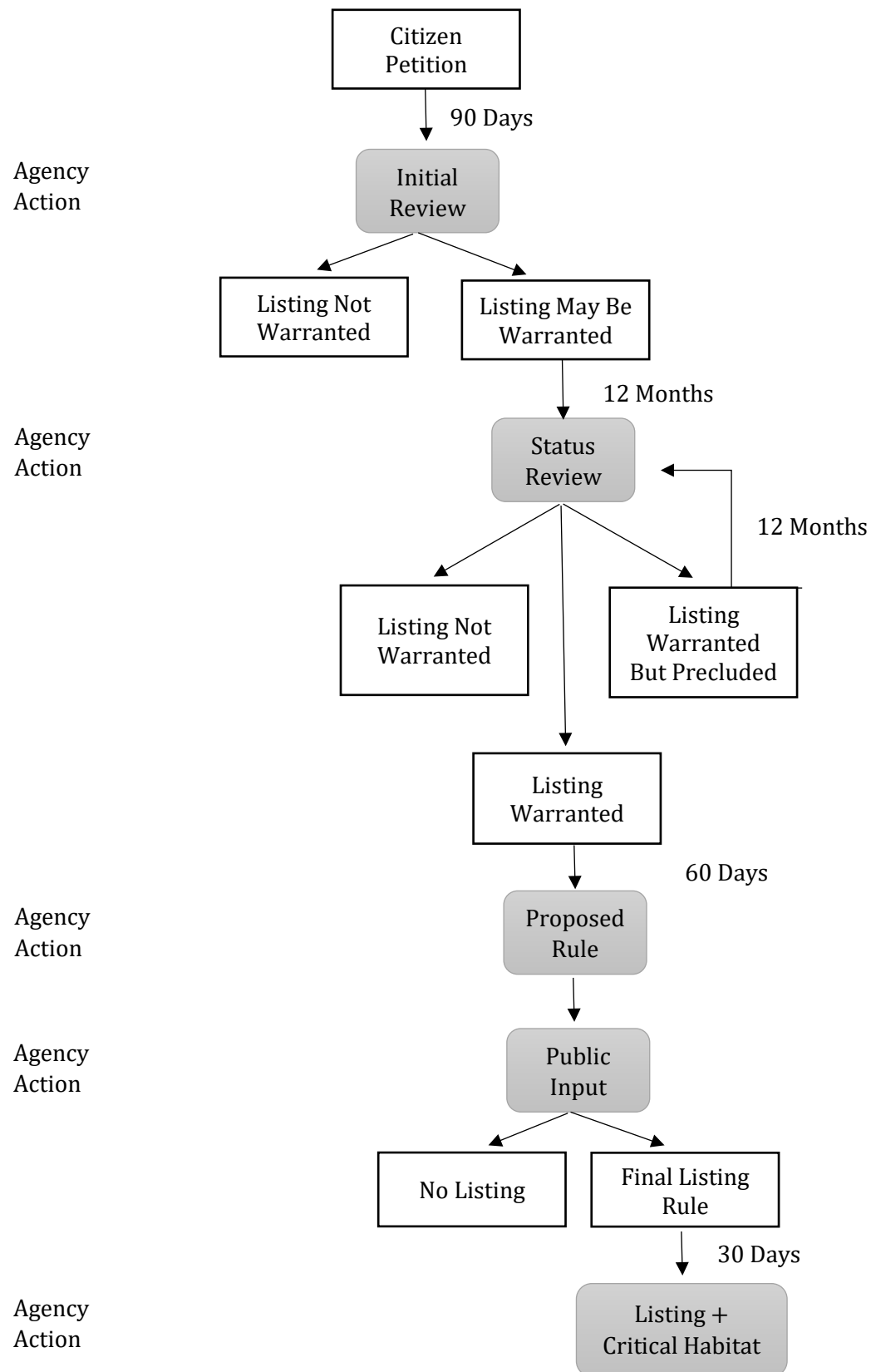


Figure 2. Listing Lawsuits and Species Listings per Year

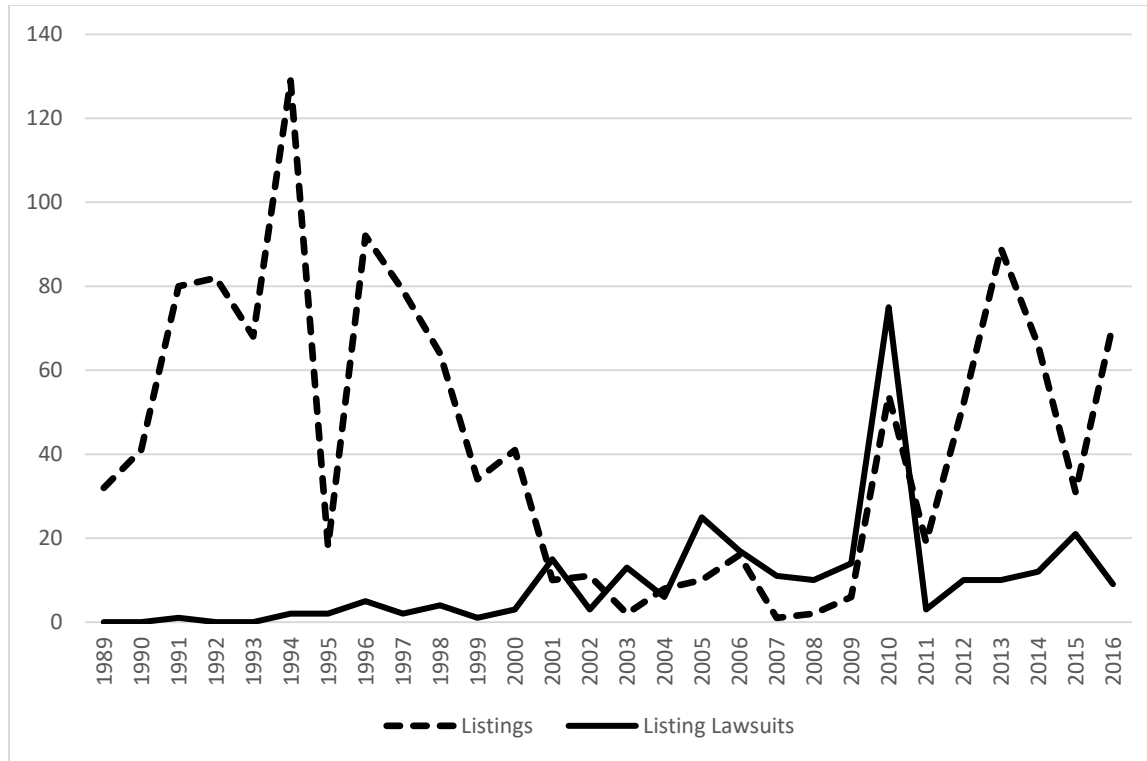


Figure 3a. Judicial Ideology and Litigation

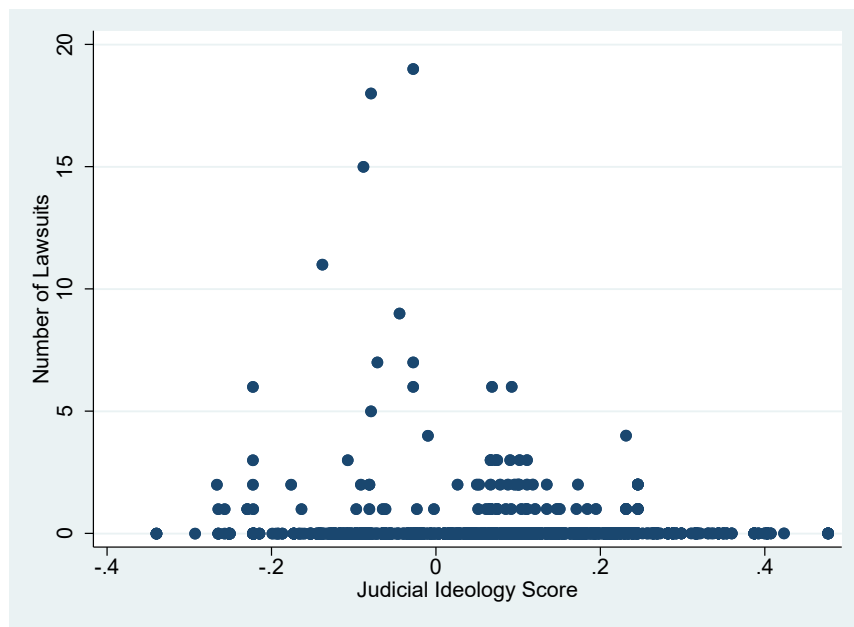
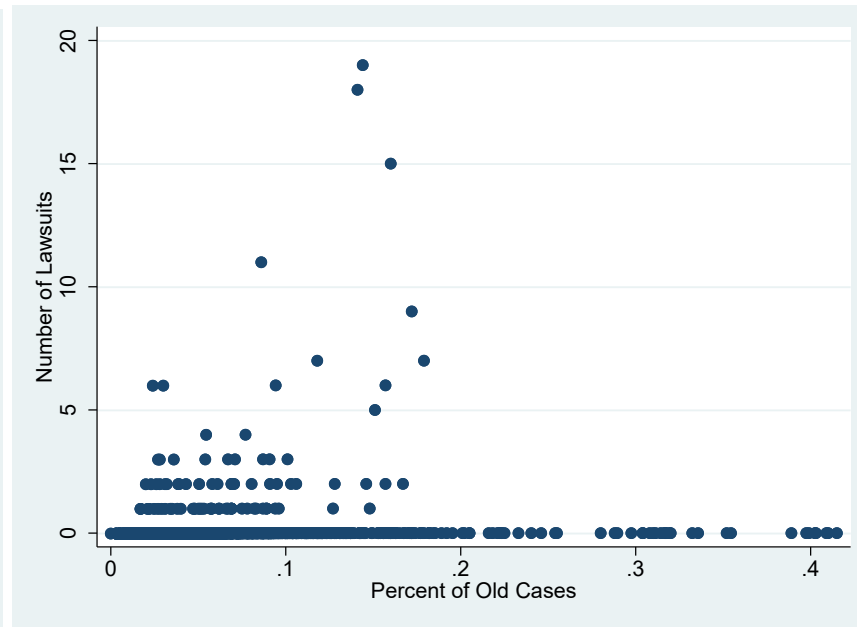


Figure 3b. Percent of 3-or-More Year Old Cases and Litigation



## **Appendix for Interest Groups, Litigation, and Agency Decisions: Evidence from the Endangered Species Act**

### **Benefit – Cost Calculations**

Willingness to pay to avoid loss of Atlantic Salmon is estimated to be \$10 in 2006 dollars (Richardson and Loomis 2009) which, using the Consumer Price Index, is adjusted to \$12.69 in 2019 dollars. The survey used to generate this estimate was administered to households in Massachusetts, and the response rate was 30%. There were 2.651 million households in Massachusetts in 2019. To be conservative, this number is adjusted down by the 30% response rate, which yields 0.7953 million households. Given WTP of \$12.69 per household, this translates into a benefit of \$10.09 million. Given that a lawsuit increases the probability of listing by 18%, I further scale down this benefit by multiplying it by 0.18, which yields \$1.82 million.

Costs of litigation are calculated using publicly available information from a large environmental group that is active in ESA litigation (<https://www.biologicaldiversity.org/index.html>). Audited financial reports provide information on program-specific expenditures. I use the expenditures reported for their Endangered Species Program for 2017-2019, conservatively assuming that the whole amount corresponds to the costs of litigation. The group also reports all lawsuits filed during that period, and I select the ones that are related to endangered species conservation, to obtain a total of 79 lawsuits during that period. Finally, I divide total costs by number of lawsuits to obtain an estimate of average cost per lawsuit, which is \$170,089. Because there is no separate information available on the costs of litigation for FWS, I assume their costs per lawsuit are the same.

**Table A1 – Summary Statistics**

Variable	All Species				Listed Species			
	Mean	Std. Dev.	Min.	Max.	Mean	Std. Dev.	Min.	Max.
Listed	0.094	0.292	0	1				
Recovery Expenditures (\$ millions)					0.508	1.492	0	29.01
Critical Habitat					0.322	0.467	0	1
Critical Habitat Size (acres 1000s)					199.6	1,181.2	0	9,763.9
Cumulative Own Lawsuits	0.033	0.338	0	22	0.480	1.928	0	34
Cumulative Other Lawsuits	5.271	7.191	0	48	6.231	7.991	0	48
Mean Judicial Ideology Score	0.104	0.044	-0.096	0.177				
Mean Cases Over Three Years Old	6.117	1.729	0	16.3				
Mammal	0.144	0.351	0	1	0.233	0.423	0	1
Amphibian	0.109	0.312	0	1	0.054	0.227	0	1
Bird	0.300	0.458	0	1	0.279	0.449	0	1
Reptile	0.112	0.316	0	1	0.093	0.291	0	1
Body Size (cm.)	30.052	41.954	2	825	48.047	64.134	3	400
Distinct	0.295	0.456	0	1	0.395	0.489	0	1
Mean Population Growth (%)	0.013	0.009	-0.049	0.116	0.015	0.012	-0.024	0.116
Mean Population Density	166.74	171.64	0.829	2700.7	136.08	115.52	4.680	903.10
Mean % Republican Vote	0.483	0.076	0.050	1.0	0.472	0.092	0.178	0.782

**Table A2 – Covariate Balance: Standardized Difference in Means**

Variable	Unmatched	Critical Habitat Designation		Recovery Expenditures	
		Matched <sup>a</sup>	% Reduction <sup>b</sup>	Matched <sup>a</sup>	% Reduction
Critical Habitat	-0.35	0.03	91.8		
Recovery Expenditures	0.35			0.21	41.4
Recovery Status	-0.06	-0.10	-70.5	-0.09	-47.3
Mammal	0.37	0.00	100.0	0.03	91.9
Amphibian	-0.07	0.00	100.0	0.00	100.0
Bird	-0.05	0.00	100.0	0.00	100.0
Reptile	-0.07	0.00	100.0	0.00	100.0
Fish	-0.20	0.00	100.0	-0.03	87.1
Body Size	0.59	0.22	62.3	0.23	61.3
Distinct	0.28	0.24	15.5	0.25	11.1
Lead Region	0.02	-0.08	-401.3	-0.16	-918.7
Population Growth	-0.02	0.06	-223.2	-0.08	-286.2
Population Density	0.02	-0.18	-1080.9	-0.06	-297.7
Republican Vote	0.17	0.09	43.1	0.10	40.0

<sup>a</sup> Mahalanobis matching, 4 neighbors, no caliper.

<sup>b</sup> % Reduction in (absolute value of) bias achieved by matching.

**Table A3 – Sensitivity for Listing Model: Fixed Effects**

Dependent Variable: Listing	
Explanatory Variables	
ln Cumulative Own Lawsuits	0.439** (0.0220)
ln Cumulative Other Lawsuits	-0.004 (0.2503)
Mean Population Growth	1.289 (0.3143)
Mean Population Density	-1.62E-04*** (0.0000)
Mean Republican Vote	-0.013 (0.7187)
Body Size	8.22E-04 (0.1522)
Distinct	0.012 (0.2062)
Taxonomic Variables	Yes
Diet Variables	Yes
Habitat Variables	Yes
Administrative Region Fixed Effects	Yes
Year Fixed Effects	Yes
State Fixed Effects	Yes
Species Fixed Effects	No
Spending Cap Dummy Variables	Yes
Observations	66,555
Kleibergen-Paap Wald rk $F$ - Statistic	29.43
Prob > $F$	0.0002

Administrative Region-level cluster - robust standard errors.

$p$  - values in parentheses.

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

**Table A4 – Sensitivity for Critical Habitat and Expenditures Models: Omitted Time-Variant Controls**

Model (Dependent Variable)	$\delta$	
	ln Cumulative Own Lawsuits	ln Cumulative Other Lawsuits
Critical Habitat Designation	17.35	3.26
ln Critical Habitat Size	4.33	28.23
ln Expenditures	2.96	

**Table A5 – Sensitivity for Critical Habitat and Expenditures Models: Alternative Treatment**

Explanatory Variables	Dependent Variable		
	Critical Habitat Designation	ln Critical Habitat Size	ln Expenditures
ln Cumulative Own Lawsuits	0.152* (0.0723)	1.713* (0.0535)	0.202 (0.1341)
ln Cumulative Other Lawsuits	0.004*** (0.0000)	0.069*** (0.0000)	0.012 (0.7848)
Mean Population Growth	-0.157 (0.8720)	0.769 (0.9371)	-1.397 (0.3123)
Mean Population Density	-0.002** (0.0183)	-0.016** (0.0178)	0.002 (0.6907)
Mean Republican Vote	0.011 (0.9509)	-0.380 (0.8377)	-0.193* (0.0961)
Year Fixed Effects	Yes	Yes	Yes
Species Fixed Effects	Yes	Yes	Yes
Spending Cap Dummy Variables	Yes	Yes	Yes
Observations	3,172	3,172	3,354

Administrative Region-level cluster - robust standard errors.

*p* - values in parentheses.

\*\*\* *p* < 0.01, \*\* *p* < 0.05, \* *p* < 0.1.

**Table A6 – Sensitivity for Critical Habitat and Expenditures Models: Fixed Effects**

Explanatory Variables	Dependent Variable		
	Critical Habitat Designation	ln Critical Habitat Size	ln Expenditures
ln Cumulative Own Lawsuits	0.179* (0.0617)	2.157* (0.0554)	0.630*** (0.0011)
ln Cumulative Other Lawsuits	0.004 (0.3216)	0.075** (0.0297)	0.002 (0.9610)
Mean Population Growth	-1.213 (0.5036)	-16.522 (0.5054)	3.245 (0.4675)
Mean Population Density	-4.6E-04 (0.7070)	-0.002 (0.9024)	-2.7E-04* (0.0896)
Mean Republican Vote	-0.432*** (0.0017)	-5.900*** (0.0000)	0.945 (0.2632)
Body Size	0.001 (0.4715)	0.018 (0.3559)	0.002** (0.0326)
Distinct	0.046 (0.6924)	0.013 (0.9653)	-0.042 (0.8157)
Taxonomy Variables	Yes	Yes	Yes
Diet Variables	Yes	Yes	Yes
Habitat Variables	Yes	Yes	Yes
Administrative Region Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes
Species Fixed Effects	No	No	No
Spending Cap Dummy Variables	Yes	Yes	Yes
Observations	3,016	3,016	3,172
R <sup>2</sup>	0.607	0.647	0.457

Administrative Region-level cluster - robust standard errors.

*p* - values in parentheses.

\*\*\* *p* < 0.01, \*\* *p* < 0.05, \* *p* < 0.1.

Figure A1 – Map of U.S. Fish and Wildlife Administrative Regions



Source: U.S. Fish and Wildlife Service

<https://www.fws.gov/endangered/regions/index.html>

Figure A2 – Instrumental Variables by FWS Administrative Region and Year

