The Cost to Comply: Habitat Conservation Plans under the Endangered Species Act

By: Julia Plasynski and Erin Keleske

Under the Advisory of: Sara Mason

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Executive Summary

Passed in 1973, the Endangered Species Act (ESA) authorizes the U.S. Fish and Wildlife Service (USFWS) and the U.S. National Oceanic and Atmospheric Administration (NOAA) to save endangered species "whatever the cost" (ESA; P.L. 93-205, 87 Stat. 884, 16 U.S.C. §§1531-1544). This resolute language often conflicts with economic development projects that may harm or kill (i.e., "take") an endangered species. Section 10 of the ESA was introduced as a compromise between conservation and economic interests – non-federal stakeholders can develop Habitat Conservation Plans (HCPs) to minimize or offset the impacts of their actions and subsequently receive an Incidental Take Permit (ITP), allowing them to continue with development in spite of a predetermined level of take. HCPs have since become a widely-used but controversial permitting tool, but they come with associated costs for planning (consultant fees, review by scientists, staff time, etc.) and for implementation (monitoring, mitigation, habitat restoration, etc.).

The Electric Power Research Institute (EPRI) is an independent non-profit energy research organization that aims to ensure the development of clean energy, with a foundational mission to benefit society. EPRI has been investigating the often-unreported costs associated with HCPs to better understand the relationship between species conservation and renewable energy production.

Our project explores key avenues for EPRI's research, specifically we:

1. Interviewed EPRI members to understand HCP pre-implementation activities and design a survey that estimates these pre-implementation costs.
2. Investigated new sources of HCP implementation cost data, including a new online repository of HCPs and proposed opportunities for future study.

3. Created a more in-depth but streamlined, automated analysis to allow for quick calculations of anticipated implementation cost estimates.

After finishing our objectives, we also propose and outline next steps for EPRI, including:

1. Sending out a survey to EPRI's membership to estimate pre-implementation costs
2. Advocating and taking steps towards a central HCP database through relationship building and policy advocacy
3. Utilizing data scraping and machine learning to automate future data collection
4. Focusing their research on additional species beyond their existing bat research
5. Creating a search engine that would allow EPRI's members to better estimate potential costs of planning and implementing an HCP
6. Expanding their research beyond average costs to look at questions of ESA bias and accuracy of costs listed in HCPs
7. A full cost-benefit analysis once adequate data is available

This project and EPRI's ongoing research will inform future policy recommendations and build a stronger understanding of the costs to comply with the ESA.

Table of Contents

The "Train Wreck of the Endangered Species Act……..04
Processes and Permits for Incidental Take……...07
1. *Statutory Context: the U.S. Endangered Species Act.*……07
2. *What is Incidental Take?*.....08
3. *Creating an HCP and Applying for Incidental Take*……...10
4. *The Illusion of Choice: Why submit an HCP?*.....11
5. *Critiques of HCPs*……...14
Endangered Species and Renewable Energy……...16
1. *Environmental Trade-Offs*……...16
2. *Importance of Economic Perspectives*……18
3. *The Electric Power Research Institute (EPRI)*.....20
4. *Project Overview and Objectives*……20
Pre-Implementation Costs……22
1. *Materials and Methods - Interviews and Survey*……....22
2. *Results and Observations - Interviews*……23
3. *Next Steps - Pilot Survey*……25
Implementation Costs……...26
1. *Materials and Methods - EPRI's Bat Conservation Cost Data*……...26
2. *Results - Evaluation of EPRI's Bat Data*……28
3. *Materials and Methods - Defenders of Wildlife HCP Repository*……...29
4. *Results - Evaluation of Defender's Database*……30
5. *Materials and Methods - Automating the Analysis*……35
6. *Results - Reproducible R Code*……...36
Limitations of HCP Research……...37
Future Recommendations……40
1. *Survey of Pre-Implementation Costs*……...40
2. *Policy Recommendations towards a Central Database*……..41
3. *Data Scraping and Machine Learning*……42
4. *Species Recommendation*……43
5. *Search Engine*……44
6. *Future Research*……..44
7. *Benefit Cost Analysis*……..44
Appendix……..46

** For a full list of abbreviations used throughout, see Appendix Table A1.

The “Train Wreck” of the Endangered Species Act

It was 1976 when the Mission blue butterfly caused the long-forecasted “trainwreck” of the Endangered Species Act (ESA). The United States Fish and Wildlife Service (USFWS) had just listed the Mission blue as federally endangered, and the species’ remaining habitat along San Francisco’s San Bruno Mountain was now under the watchful eyes of local California environmentalists. The primary landowner on the mountain, Visitacion Associates, faced legal action unless they halted their ongoing development projects. Instead, Visitacion struck a deal with local environmentalists – they’d restore and preserve 2,000 acres of habitat if they were permitted to develop the remaining 1,500 acres of their property (Thomas, 2001). This deal became the first federally-recognized Habitat Conservation Plan (HCP), opening the door for future compromises between economic development and endangered species protection, thus making industry leaders active participants in their own ESA-compliance.

When the ESA was passed in 1973, it was known as the “pit bull of environmental laws” because it had such fierce legal teeth. It instructed the USFWS and the U.S. National Oceanic and Atmospheric Administration (NOAA) to save endangered terrestrial and aquatic species, respectively, “whatever the cost” (Tennessee Valley Authority v. Hill, 1978). Species were to be listed “solely on the basis of the best scientific and commercial data available,” (ESA, 1988), meaning economic information could not be considered in any way or at any point – not when deciding which species to list and certainly not when deciding how to protect listed species. The ESA is also unique amongst other bedrock environmental laws in that it makes little to no connection to human health, causing some to herald it as “the strongest American legal expression to date of environmental ethics,” (Nash, 1989), especially compared to more procedural environmental regulations like the National Environmental Policy Act (NEPA) of 1970 (Thomas, 2001).

This resolute language left little flexibility for development, causing some to predict "environmental and economic trainwrecks" where these two competing interests would inevitably come to blows (Dwyer et al., 1995). The conflict over the Mission blue butterfly is considered the quintessential trainwreck of the ESA because it forced Congress to fundamentally reevaluate the statute, seemingly caving to economic demands. But the 1970's and 80's also saw a litany of Supreme Court and US Circuit Court cases testing and ultimately expanding the boundaries of the original statutory language (Petersen, 1999). For instance, Section 9 of the ESA "prohibits the taking of endangered species" and defines "take" as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." The Department of the Interior promulgated that this definition included "significant environmental modification or degradation" (ESA, 1988), or what is called "indirect harm." This interpretation was famously challenged and upheld in *Babbitt, Secretary of the Interior v. Sweet Home Chapter of Communities for a Greater Oregon* (1995). *Tennessee Valley Authority v. Hill* (1978) showed that it didn't matter how much money had already been invested in a project, ESA protections must be upheld. *United States v. Dion* (1986) said that even tribal treaty rights could not usurp the protection of a listed species, and this is just to name a few. These two decades immediately following the passing of the ESA were ultimately a battle to determine the statutory power of the ESA, with environmentalists taking some concessions with HCPs, but winning several landmark court cases.

When it passed in 1973, many members of Congress largely viewed the ESA as a symbolic means to protect charismatic megafauna – was all of this really the legislative intent? (Petersen, 1999). Justice Antonin Scalia famously said the ESA was being interpreted so as to "impose unfairness to the point of financial ruin… upon the simplest farmer who finds his land conscripted to national zoological use," (*Babbitt v. Sweet Home,* 1995). It's unclear why Congress left so much of the ESA up for interpretation, but some believe they simply lacked the foresight to anticipate how the Act would be utilized by

environmental groups or that scientific development naturally led to habitat-level conservation in a way that Congress could not have foreseen (Petersen, 1999).

These debates and landmark court cases ultimately centered around the most controversial aspect of the ESA: property rights (Meltz, 1994). Landowners barred from full use of their property and natural resources often filed suit against ESA decisions, claiming it violated their Fifth Amendment rights by "taking" (a different legal definition of take) their private property without just compensation (Thomas 2001). But the ESA is not alone on this front – wildlife policy is consistently in conflict with property rights including controversies over the Migratory Bird Treaty Act, the Eagle Protection Act, and the Wild Free-Roaming Horses and Burros Act (Meltz, 1994).

As people began to push back against the scope of the ESA, it became clear that the Act lacked a "release mechanism" for political tensions such as these – businesses frequently lobbied to prevent species from being listed and environmentalists picked their battles carefully, only fighting to list the most charismatic and publicly agreeable species (Thomas, 2001). Without a mechanism to allow for some level of economic development, the ESA was frequently branded as pitting human well-being against that of nature, with newspapers running headlines like, "*Would you spend $2.6 million on a cockroach? The federal government does*," (Sheldon, 1997). This ongoing competition between economic and environmental interests paired with the rigidity of the statutory language hyper-politicized the ESA and made progress under the Act challenging. Congress officially codified the development of HCPs in 1982 as Section 10 of the ESA to make it more flexible to economic development, much to the chagrin of environmentalists.

The decision sparked immense public debate that continues to this day, as many saw this as a divergence from the ESA's stated duty to protect endangered and threatened species regardless of the cost (Sheldon,

1997). But despite their utility, HCPs weren't immediately popular among the land developers either. Only 14 HCPs were developed in the first decade following the 1982 amendment (Thomas, 2001). Later, additional guidance from the USFWS caused their popularity to spread rapidly through the late 1990s and 2000's, with more than 1,400 HCPs enacted in total since Section 10 was first passed (USFWS, n.d.).

Processes and Permits for Incidental Take

1. Statutory Context: the U.S. Endangered Species Act

The Endangered Species Act (ESA) is a U.S. federal law enacted in 1972 to protect endangered and threatened species from extinction. The ultimate goal of this Act is to recover species and habitat for future existence. To establish protections, a species needs to become listed as either "endangered" or "threatened."

To become listed, two authorized federal agencies, USFWS or NOAA, can begin a status review, or a non-governmental organization can start a petition for a particular species. After these are started, the USFWS initiates their timed process. Once a species becomes listed, different stakeholders have a role in implementing and following the different sections of the law (for a full list of all ESA sections, see Appendix, Table A2). As mentioned previously, consideration for whether or not a species is listed as threatened or endangered must be done irrespective of cost and using the "best available scientific and commercial data" (ESA, 1988).

Once a species is listed, ESA-prohibited activities can be categorized as either a "take" as discussed above (Section 9), or as a "jeopardy" under Section 7, which regulates the interactions of other federal agencies with listed species and critical habitats. If it's determined that an agency's actions may potentially harm a

listed species, they must consult with the USFWS or NOAA in a process aptly named "Section 7 Consultation," which often results in a formal biological assessment. If it's found that the action will jeopardize a listed species, the action is indefinitely halted. The only pathway for exemptions under Section 7 is through the cabinet-level Endangered Species Committee, nominally known as the "God Squad" for their power to decide the fate of entire species (des Rosiers, 1990). While Section 7 is only applicable to governmental entities, the process is relevant because the standard for "no jeopardy" is essentially identical to the permit criterion for HCP's under Section 10 (Wilhere, 2009).

Before the ESA, there were multiple former laws for the preservation and conservation of endangered species. First, the Endangered Species Preservation Act of 1966 established a list of endangered species and enacted that any harm to these animals would be illegal. This law was amended and renamed, "The Endangered Species Conservation Act of 1969." This new version expanded the list to protect foreign as well as domestic species (USFWS (a.), n.d.). The regulations on the trade of foreign species was limited and thus, the Convention on International Trade in Endangered Species of Flora and Fauna (CITES) was drafted in 1972. This convention, CITES, provides a framework, but countries need to develop their own domestic laws. After CITES was created, Congress passed a new and revised law in 1973, "The Endangered Species Act." During this revision, Congress decided to advance the implementation of CITES and the protection of foreign species, therefore, including foreign species in this new Act (Foley et al., 2017).

2. What is Incidental Take?

As outlined in Section 10 of the ESA, the ultimate goal of developing an HCP is an Incidental Take Permit, or ITP. By developing an HCP, a developer is acknowledging their actions may result in the otherwise-illegal harm of an endangered species and are, therefore, proposing options to offset or mitigate

that harm in advance. Section 9 of the ESA defines "taking" an endangered species as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." As mentioned above, the USFWS have interpreted this definition as to include indirect harms to critical habitat, and this definition was upheld by the U.S. Supreme Court in *Babbitt v. Sweet Home* (515 U.S. 687 (1995)).

For a take to be "incidental," it must be the unintended side effect, and not the purpose, of an otherwise lawful activity. Incidental takes are most often indirect harm to a species' habitat, but they can also be direct fatalities, such as when a bat or bird flies into a wind turbine. The criteria for the issuance of an ITP is essentially identical to the 'jeopardy standard' of section 7(a) and is listed below

(c) Issuance criteria (ESA, 1988):

(1) "To issue the permit, the Assistant Administrator must find that –

(i) "The taking will be incidental;

(ii) "The applicant will, to the maximum extent practicable, monitor, minimize, and mitigate the impacts of such taking:

(iii) "The taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild;

(iv) "The applicant has amended the conservation plan to include any measures (not originally proposed by the applicant) that the Assistant Administrator determines are necessary or appropriate; and

(v) "There are adequate assurances that the conservation plan will be funded and implemented, including any measures required by the Assistant Administrator."

3. Creating an HCP and Applying for Incidental Take

Habitat Conservation Plans (HCPs) are contracts or agreements between a non-federal party and a federal agency (either the USFWS or NOAA). The goal of an HCP is to describe the anticipated impacts of the party's incidental take on the listed species and their proposed actions to monitor, minimize, and mitigate those impacts. HCPs need to utilize the "best available science" and are often written or reviewed by outside consultants or independent scientists (Sheikh et al., 2021). The final HCP must also include a plan to fund the proposed actions, procedures for unforeseen circumstances, anticipated timelines, any alternative actions they considered that would not result in the take, and why they did not choose those alternative actions. The applicant can also reference the HCP handbook that was released by the USFWS to aid their application.

In addition to the ESA, the development project has to comply with The National Environmental Policy Act (NEPA). NEPA analysis may result in the USFWS to complete an Environmental Assessment (EA) and/or Environmental Impact Statement (EIS) before approval; however, companies can provide assistance during this process. This analysis can also result in a categorical exclusion. A final application for an ITP includes the application form, the HCP, a draft NEPA analysis (including the EA or EIS), and the application fee (USFWS (c.), n.d.).

After submitting the application, the application is published on the federal register and the public has the opportunity to comment on the HCP for 30 days. NEPA also requires public comment, so this is completed at the same time. Once approved for an ITP, the party must legally follow the HCP (USFWS (b.), n.d.).

4. The Illusion of Choice: Why submit an HCP?

Habitat Conservation Plans are often seen as voluntary, but some argue they set up a difficult choice. When a private company wants to start a project or development that risks harming an endangered species, they are faced with three imperfect options: avoid taking the species all together, act illegally and risk enforcement, or apply for an ITP. While avoidance is most in line with the original goals of the ESA, this is much easier said than done. In some cases, it may even require completely forgoing use of a particular natural resource or terminating a project altogether. In reality HCPs are a difficult if not impossible deal to refuse.

Voluntary or not, participation in the HCP program is a major win for species conservation because there is evidence that HCPs work. Research has shown that listed species with HCPs are more likely to show improvement in recovery status and less likely to be in decline or go extinct (Langpap and Kerkvliet, 2012). There is evidence to support that species conservation is most effective when approached at a habitat-scale, as opposed to the typical enforcement of the ESA which tracks individual activities on a site-by-site, project-by-project basis (Thomas, 2001). Without sufficient enforcement as a threat for noncompliance, an absolute prohibition on take punishes violators retroactively, sometimes after irreparable harm has already been done to a population. This strategy does not prevent the death of an endangered species any more than vehicle speed limits prevent speeding. HCPs provide an avenue for participatory compliance.

HCPs also serve as a release mechanism for legal tensions over listings, which may also benefit species conservation. While there is still much public debate over whether or not to include certain species under the ESA, listing is no longer an insurmountable barrier for land development and thus, there is often less

industry opposition. Even with the resulting incidental take, this benefits the longevity of the species because there are fewer barriers to getting a species the federal support it needs.

Ultimately, the choice is not between whether or not to allow industries to harm endangered species; the structure of the ESA has brought developers to a choice between some incidental take with an HCP or an unfettered amount of illicit take without one. We have to assume noncompliance as the baseline because ESA enforcement has been systemically underfunded from its very inception (Malcom, 2021). Environmental groups have stepped in to report violators and challenge their actions in court (Thomas, 2001), but it's not feasible for these groups to catch all illicit take. HCPs make it more compelling for the average company to actively participate in their own ESA compliance, leaving the legal challenges to the biggest violators.

Not only is it often in a company's best interest to file for an HCP, but there's also an incentive to act early by including species in an HCP before they are listed under the ESA. Newly listed species are regulated at project sites even after projects are installed. If a company's actions are found to harm or take a species that later becomes listed, they must either completely rethink their operations to avoid the take, go through the process to file for an additional HCP, or risk ESA enforcement. Therefore, it is often in a company's best interest to include as many species in their HCP as is financially feasible and to protect species on their land before they are listed. For example, in 2015, organizations and other entities united together to protect the Greater Sage-grouse despite the USFWS's decision not to list the species. The possibility of this listing under the ESA was connected to large potential economic losses in the West and therefore, unfavored. Hence, conserving the species before reaching limits to be listed under the ESA was cost-effective and overall, beneficial (Opar 2017).

There became an even greater incentive to file multiple species under an HCP in 1994 when the Clinton Administration introduced the No Surprise Rule, which assures that applicants will not be required to implement additional land use restrictions or provide additional financial compensation if unforeseen circumstances arise under an ITP. This is to say, if an HCP is approved for a certain level of take while a species is still relatively stable, the USFWS cannot return later when the species is in more critical condition to demand the HCP be expanded or the take decreased. The federal government assumes liability for uncertainty, but only for species that are included in an HCP and only for "unforeseen circumstances" that cannot "reasonably be anticipated," (ESA, 1988). However, the USFWS can add provisions to the ITP stating the HCP must be altered if it proves ineffective. This decision assuaged fear that HCPs would lead to disproportionate enforcement of ESA over those who chose to file. Clinton's No Surprise Rule led to a sharp increase in HCP usage after 1994 (Wilhere, 2009) and further incentivized early inclusion of species.

This conversation is increasingly important in the face of climate change which adds a level of unpredictability to species conservation, but HCPs were never intended to provide ecological certainty but to increase economic certainty. Applicants spend years and substantial amounts of money to develop and implement HCPs because they want to know exactly what they can do on their land and with their resources (Thomas, 2001). Before HCPs and the No Surprise Rule, there was a fear that at any moment the federal government could render a property or its resources unusable. Without even knowing it, a developer's actions could be a violation of the ESA through an incidental take or a newly endangered species could be discovered on your property. The HCP process helps property owners understand the potential consequences of their actions and provides property-specific guidelines, adding much-needed specificity for those attempting to comply with the ESA.

5. Critiques of HCPs

HCPs are considered one of the most controversial components of the ESA. Environmentalists think it undermines the Act by prioritizing economic gain over species preservation, thus contradicting the expectation to protect endangered species "whatever the cost." Based on the current interpretation of the statutory language, if there were alternative actions that could prevent the take, shouldn't the landowner have to do that instead regardless of the cost? George Wilhere of the Washington Department of Fish and Wildlife posited three Paradoxes of Habitat Conservation Plans (2009) to explain some of these logical inconsistencies within the HCP Program:

1. The Trainwreck Paradox questions whether HCPs actually solve the aforementioned environmental and economic trainwrecks of the ESA. People claim that HCPs help prevent the listing of species as threatened or endangered, but federal listings (or the threat of listing) are the only thing motivating landowners to develop HCPs in the first place. "In reality, if a species is threatened or endangered with extinction, then the environmental trainwreck has already occurred," (Wilhere, 2009).
2. The Jeopardy Paradox references the vague language of section 10(a) which is nearly identical with the 'jeopardy' language of section 7(a). The USFWS is allowed to grant ITPs only when the applicant's actions will result in an "appreciable" reduction of survival likelihood for the species, but what does 'appreciable' mean?
3. Finally, the Maximum Mitigation Paradox highlights how the applicant must monitor, minimize, and mitigate the impacts of their taking to the "maximum extent practicable," but if they're actually maximizing mitigation efforts, then there would be no financial resources for adaptive mitigation in the future.

Beyond discussions of Congressional intent and statutory language, there are also scientific critiques of HCPs and the ESA in general, questioning whether they are effective at protecting threatened and endangered species. Species are too severely imperiled by the time they're listed under the ESA and delisting is only considered possible for about 74% of species with developed recovery plans (Neel et al., 2012), with a notorious bias towards charismatic megafauna instead of overall ecosystem function (Rohlf, 1991). The population levels set by the ESA as "necessary for long-term persistence" of a species are almost always lower than what is biologically necessary for the species to adequately recover (Neel et al., 2012). And even if the species were to recover, the ESA does not protect sufficient habitat to sustain the "recovered" populations (Rohlf, 1991).

ESA protections are only as strong as their enforcement – not just of the legal stipulations outlined in the HCP but of the overall prohibition on take in the ESA. If developers do not feel a sense of risk associated with violating the ESA, there would be no incentive to prepare and implement an HCP, let alone take more difficult measures to fully avoid the take of an endangered species. ITPs are like a get out of jail free card, but why would companies bother if they know they will not be faced with consequences? This is why HCPs are more frequently developed in areas of the country where Section 9 prohibition on take is the strictest (Anderson and Yaffee, 1998). The efficacy of HCPs fully relies on strong enforcement by the USFWS and NOAA and on citizen suits from environmental organizations (Thomas, 2001). This is not even to mention the inefficiency of a system with varying levels of enforcement throughout the country.

The HCP process also lacks standardization, creating inefficiencies and burdens on the applicants. The USFWS released an HCP Handbook, which provides some recommendations for how to draft an HCP, but the system is far from standardized. Each USFWS Regional Office has different expectations and procedures, and each HCP must be tailored to the industry, type of development, and the scope of the

project. The party drafting the HCP also must make a range of decisions about what to include and how to file (Thomas, 2001). Are they submitting as an individual or with partners? Will they request public input? What conservation and policy tools will they propose to mitigate and minimize their harm? All of this variation is compounded by the inherent variation of tailoring HCPs to protect over 2,400 different endangered species (Sheikh et al., 2021).

Endangered Species and Renewable Energy

1. Environmental Trade-Offs

When the debate over HCPs first began, it was common to pose environmental and economic interests as natural opponents that would inevitably lead to the "train wreck of the ESA." But as the climate crisis forces us to rethink, reorganize, and rebuild our infrastructure, the lines between environmental and economic development are blurred. These are real and pressing environmental trade-offs: do we prioritize conservation or climate? How do we balance these interconnected but often conflicting needs? These questions are being answered in real time as society addresses species extinction and global climate change in the face of growing energy needs.

Throughout history, the planet has endured five mass extinction events, with the last one occurring over 65 million years ago. Today, countless scientists and experts believe we are in the midst of a sixth mass extinction. The difference between this believed current mass extinction and past events, is that this one is driven by humans and their effect on the planet (WWF, n.d.). Climate change, and what some are referring to as the "climate crisis" is affecting all life, including wildlife. Rising temperatures can lead to less food availability, less successful reproduction, increasing invasive species, and increasing extreme

weather events, such as floods or droughts (NPS, n.d.). Additionally, climate change can affect gene structure, animal behavior, and overall, contribute to the decline of habitats and species (IUCN, 2019).

The use of fossil fuels - coal, oil, and gas - is the main contributor to the climate crisis and in 2021, 79% of the United State's energy came from fossil fuels. Thus, leading to a widespread desire to switch from nonrenewable energy sources to renewable ones, such as wind and solar. In 2021, only 12% of energy came from renewable sources in the United States, with wind, hydroelectric, and solar being the top producers (EIA, 2021). Although climate change affects the health of wildlife populations and even the continued existence of some species, the construction and maintenance of renewable energy sources, can also pose a threat to wildlife.

Terrestrial renewable energy sources, like wind and solar, require vast amounts of land, which can deplete habitats or cause habitat fragmentation. Sourcing the critical minerals necessary to manufacture these renewable energy generators can exacerbate existing mining pressures, leading to further loss of biodiversity and critical habitats (Sonter et al., 2020). Hydroelectric power completely reshapes aquatic habitats, transforming species assemblages and creating novel ecosystems (Agostinho et al., 2008). Construction of these energy sources can lead to indirect effects from noise, vibrations, and light pollution, and increased energy capacity in a region can lead to further development.

The above listed activities mainly lead to forms of indirect take, or harm to an endangered species' habitat, but renewable energy generation can also lead to direct take. While often disregarded as just a conservative counterargument against renewables, wind turbines do lead to the death of flying species through direct collisions (Gaultier et. al, 2020). Terrestrial and offshore wind farms may be killing millions of migratory birds and bats every year (Moore, 2019).

None of this is to imply that renewable energy sources are somehow *bad* for the environment or that wind turbines are even a leading cause of bat and bird death. In fact, house cats kill more birds than wind turbines by orders of magnitude (Loss et al., 2015). But these trade-offs need to be acknowledged and difficult decisions need to be made in order to balance these conflicting needs.

HCPs serve as a mechanism to achieve that balance, without which wind farms would likely all be noncompliant with the ESA. But this begs the question, is it more beneficial to slow the production of renewable energy in hopes to save endangered or threatened individuals *OR* is it more beneficial to allow an expedited transition to renewable energy to save species? Surely an argument can be made that, in the long run, the clean energy collectively produced by wind turbines will save far more bats and birds than they kill by mitigating the impacts of global climate change. But where is the line? And if we bend the ESA for actions that we perceive as environmentally permissible, who's to say that flexibility can't be given to other economic development needs?

2. Importance of Economic Perspectives

Understanding the costs associated with these environmental trade-offs can help us answer these difficult questions and maximize benefits for both species protection and renewable energy generation. Attempts to analyze the costs associated with species protection often receive pushback, because the ESA was intended to protect threatened and endangered species "*whatever the cost*" (Tennessee Valley Authority v. Hill, 437 U.S. 153 (1978)). But just because the government can't consider costs, that doesn't mean that no one should, especially in regards to HCPs.

Ultimately, economics is the study of human behavior. Section 10 of the ESA gives landowners choices: they can avoid taking an endangered species, they can violate the ESA and risk enforcement, or they can

apply for an ITP. Analyzing costs helps us understand industry behavior when faced with these imperfect choices. If creating and implementing an HCP becomes too cost-prohibitive, it may make more economic sense for a company to simply break the law and risk the consequences. If enforcement is weak (or nonexistent), then what financial incentives do these institutions have to comply with the ESA at all? And maybe there's a secret fourth option entirely – perhaps protecting and conserving a species before it's listed, even if there's no legal mandate to do so, is the most cost-efficient solution of all. These questions cannot be answered without some form of benefit-cost analysis to understand the opportunity costs of complying with the ESA. This becomes all the more true in the face of the very real financial limitations faced by renewable energy companies.

Of course, financial resources are extremely limited for species conservation too, but there is a direct correlation between how much we spend on a species' conservation and that species' likelihood of survival (Miller et al., 2002). This is because species endangerment and extinction is as much a problem of economic constraints and decisions as it is a biological problem (Langpap et al., 2018). Considering costs can make environmental causes more palatable for traditionally non-environmental audiences (Mooney, 2015), which could lead to more funding overall for species conservation. Public and philanthropic grants are not sufficient enough to fund conservation methods; we need to access private capital if we want to ensure the long term survival of these populations (Standing, 2022).

All of these factors can result in greater conservation potential and real ecological benefits. Economists have shown that including costs in conservation decision-making for projects with fewer resources can lead to even more biodiversity success than plans that do not consider costs at all (Naidoo and Ricketts, 2006). This is because cost analysis allows for more efficient allocations of resources. The Bull Trout gets 1637% of their recommended funding, while the Beautiful Pawpaw plant only gets 0.04% (Cornwall, 2018). This isn't because of these species' respective conservation potential, but simply a bias towards

charismatic megafauna. Through benefit-cost analysis, we can maximize the conservation of the species with the most benefit for the ecosystem overall, instead of the species humans are simply prone to pay more attention to.

3. The Electric Power Research Institute (EPRI)

The Electric Power Research Institute (EPRI) sits at the nexus of these environmental trade-offs. EPRI is an independent non-profit energy research organization that aims to ensure clean energy, with a foundational mission to benefit society. They're funded by a membership of organizations from the energy sector, academia, and governmental organizations, located mainly in the U.S. but also in numerous countries across the globe.

EPRI works with diverse stakeholders including scientists, engineers, government, academia, and industry experts to generate their extensive portfolio of objective, science-based research. EPRI's members guide the focus of these research objectives and then benefit from the final product by accessing leading-edge information and tools to "make our work safer, more sustainable, responsive, and future-focused," (EPRI, n.d.). EPRI's membership also benefits from access to cutting edge technology, collaboration with industry peers, policy advocacy resources, and technical advisory.

4. Project Overview and Objectives

EPRI's members have identified a need to better understand the cost of compliance under the ESA. EPRI partnered with researchers from the University of Arizona to conduct novel research on this front, focusing on the intersection of bat HCPs and wind energy production (Surrey et al., 2022). While this report successfully pioneered the use of HCPs to better understand conservation costs, the results were

largely inconclusive, claiming that “Habitat Conservation Plans provide limited insight into the cost of complying with the Endangered Species Act,” (Surrey et al., 2022). This can largely be attributed to lack of data, with a very limited number of HCPs available for download and even fewer with explicit cost details. These limitations are described in more detail in subsequent sections. This is currently the largest study ever conducted on ESA compliance costs, despite the lack of a full analysis.

EPRI wants to expand this research by looking at new types of analyses and additional sources of data. Almost immediately after EPRI completed their first study, Defenders of Wildlife filed a Freedom of Information Act request to access a massive, new repository of HCPs (Carter et al., 2021), opening new doors for this style of analysis. But EPRI also expressed an interest in expanding their research beyond the costs outlined in these HCPs to include the cost of creating HCPs themselves. These pre-implementation costs include all activities leading up to finalizing the HCP.

Our objective was to propose opportunities for the continuation of EPRI’s work, including opportunities to investigate pre-implementation costs and to continue estimating implementation costs associated with HCPs under the Section 10 of the ESA. Specifically we:

1. Interviewed EPRI members to understand pre-implementation activities and design a survey that estimates these pre-implementation costs.
2. Investigated new sources of implementation cost data, including the Defenders of Wildlife new online repository and proposed opportunities for future study.
3. Create a more in-depth but streamlined, automated analysis to allow for quick calculations of anticipated implementation cost estimates

This project and EPRI's ongoing research will inform future policy recommendations and build a stronger understanding of the costs to comply with the ESA. It also identifies barriers that need to be remedied in order to get a fuller picture of HCP compliance costs.

The project methods and results are split into two main sections below, Pre-Implementation Costs and Implementation Costs, as the nature of these data and methods used to collect them vary significantly.

Pre-Implementation Costs

1. Materials and Methods - Interviews and Survey

To characterize and enable EPRI to estimate pre-implementation costs, we conducted interviews with EPRI members and then designed a survey. Discussing the HCP process and pre-implementation activities with members will allow a better understanding of HCP perceptions and the process before creating the survey.

For the interviews, an IRB exemption was received. A total of six semi-structured interviews of EPRI members were conducted over Zoom. These interviews lasted 30 to 45 minutes each. Due to these being exploratory interviews, they were not recorded. The identities of the individuals are anonymous and protected, by being referred to as "EPRI members."

The recruitment process for the interviews included a list of members to contact from our client, EPRI. The interview population was chosen to represent a particular population: EPRI member status and experience with HCPs.

Using feedback from the interviews, we decided to create a straightforward and simple survey that asks respondents direct cost questions based on five hypothetical scenarios. Next, we created the "identifier questions" for the participant to answer, to distinguish if they work directly in the company or are outside consultants. These responses to the "identifier questions" will help analyze the results. Additionally, throughout the survey, some questions are catered just towards outside consultants.

Then we created a total of five scenarios that include differing energy projects based on past HCP examples. The survey is designed for the participant to fill out each of the five scenarios, with an option to skip scenarios that are not applicable. Each scenario has associated questions about pre-implementation activities with fill-in-the-blank answers. The questions also include questions about potential indirect costs, such as the number of hours spent on certain activities. The pilot survey can be found in the Appendix, as Figure A1.

2. Results and Observations - Interviews

The exploratory interviews of six EPRI members revealed common themes surrounding the HCP process and survey of pre-implementation costs. To begin, the HCP process is perceived differently across the members, but a common theme emerged of potential applicant burdens. Secondly, members believe understanding cost transparency within pre-implementation costs will be difficult due to differences

across companies and lastly, members revealed ethical dilemmas surrounding HCPs and protecting endangered species.

Interviewees discussed concerns about the HCP process, such as applicant burdens because of "hidden" costs, time constraints, and geographical differences. When developing an HCP, some interviewees feel more burdens than others and overall, may feel more than the granting agency. Research and pre-implementation activity costs may be minor to some companies (usually larger companies), but not all. For instance, a company with fewer employees may need to spend additional time or hire additional help during the pre-implementation phase. Although these costs appear minor, there is value in knowing them beforehand.

One of the main concerns expressed by interviewees is the time commitment of the HCP process. One member explained how losing time is the largest cost. While waiting for approval of an HCP, wind turbines may not run to full capacity; therefore, losing money and renewable energy. The member argued how losing renewable energy is also not beneficial for endangered species due to the climate crisis.

Additionally, the USFWS is divided into eight different geographical regions. While states and regions have borders, project construction and species do not always follow them. Therefore, if a company develops projects and HCPs across regions, they have to follow different guidelines and laws. This can make applicants feel an extra constraint.

In addition to the theme of applicant burdens, a common theme of reluctance in completing a survey emerged. When asked about answering survey questions to help with cost transparency, members appeared to be reluctant, but willing. Although members agreed that cost transparency is necessary, they

explained how costs and pre-implementation activities across HCPs vary significantly, so creating a standardized survey may be difficult. For instance, one company may pay different amounts for consultant fees, legal fees, employee salaries, administration fees, etc, than another company may pay. Therefore, the survey needs to find a way to standardize differing costs, states, company sizes, species, energy products, and other details.

Finally, members explored ethical dilemmas and questions that arise when discussing potential benefits and consequences of the HCP process. Although the HCP process may result in burdens, there are clear benefits to Section 10 of the ESA. One member questioned what companies would do without HCPs and therefore the development of them, while another member questioned how to protect endangered species, while utilizing the most renewable energy. This member continued to discuss the difficulty in weighing the protection of endangered species versus producing more renewable energy. Since climate change is the overarching problem, will the guidelines set by HCPs benefit the existence of the species or potentially harm it? This dilemma was explored earlier in the section, "*Overview of the Conflict/Trade-Off*".

These exploratory interviews were extremely helpful in gaining a better understanding of HCP burdens as perceived by HCP creators, pre-implementation costs, and also, benefits. This insight led to the specific structuring of the survey and survey distribution timeline.

3. Next Steps - Pilot Survey

A pilot survey was created with the responses from the interviews; however, it has not been sent to members yet. The purpose of the pilot survey is to help EPRI build a future and more comprehensive

survey. We provide future recommendations for the pilot survey and another future survey in the section, "*Future Recommendations*."

Implementation Costs

1. Materials and Methods - EPRI's Bat Conservation Cost Data

This research builds off of an existing study completed in 2022 by EPRI and students from the University of Arizona which looked at the implementation costs of 23 bat habitat conservation plans (Surrey et al., 2022). This data was manually extracted from 23 bat HCPs, all publicly accessible on the USFWS's Enviornmental Conservation Online System (ECOS). At the time of collection, ECOS had 702 HCPs listed but only 78 with pdfs available for download and only 43 with explicit cost data broken down by conservation activities. While their original study focused on all 43 HCPs, featuring 115 endangered species, the data available for the continuation of this project focused on 23 HCPs with bat species.

For each HCP, authors of the 2022 study pulled basic identifying information (the name of the HCP, the region, industry, and the company applying for the ITP), details about project scope (duration, project acreage, number of wind turbines, etc.), and biological targets (names of all species listed in the HCP and the annual take allowed by the USFWS for each bat species). Each HCP was also identified as either programmatic (large-scale, regional, area-wide) or non-programmatic (project-scale, smaller defined areas), as defined by USFWS's guidance (USFWS and NMFS, 1996).

From there, EPRI searched for relevant conservation actions and their associated budgets. While there is an official HCP Guidebook, there is no official mandate about how HCPs should be written and,

therefore, little consistency across HCPs or across regions of the country. This variability is especially true for cost information. While all HCPs contain some form of budget summary in order to meet the fifth requirement for issuance of an ITP, these numbers are calculated in a variety of different ways. Some HCPs list yearly or itemized costs, others only give total budgets over the life of the project or over all conservation activities. Some list cost estimates in the net present value of the year they were drafted and others account for inflation. There's also no consistency in how the budget estimates are calculated, making it difficult to compare costs across regions or even across similar companies within a region. This flexibility is likely necessary to accommodate for such a wide range of species listed under the ESA, their associated habitat needs, and their fluctuating conservation statuses, but it still provides technical challenges for data collection.

EPRI focused on conservation activities that could be considered permitting, implementation, construction, operations and maintenance, or decommission. Any actions considered to be "planning" (or pre-implementation) were excluded from this research because the costs of creating the HCP would not be included in the HCP itself. This deficit is what prompted our research to find a different way to estimate pre-implementation costs. The costs outlined in these HCPs were categorized into broad action categories, detailed below in Table 1.

It's important to note that the values being pulled from HCPs are not realized costs, just budget estimates provided for planning purposes. They indicate what the applicant was anticipating spending on the conservation action. Finalized ITPs often reflect lower levels of permitted take than was originally proposed in an applicant's HCP, meaning that listed budgets are associated with lower conservation standards than what is agreed upon in the final permit. No research has been done regarding whether these estimates match what is actually spent on the project, but the final cost may be higher as the applicant

attempts to meet this lower level of permitted take. The USFWS tries to give some ideas of approximate cost so that applicants have some idea of what to expect, but these numbers lack specificity because the USFWS does not want to make false promises that could potentially stall the permitting process.

Table 1. Conservation actions by implementation stage, as categorized in Surrey et al., 2022.

Implementation Stage	*Conservation Action*
Permitting	● Species-Specific Field Survey and/or Analysis ● HCP Planning and Development
Implementation	● Compensatory Mitigation/Habitat Restoration ● Monitoring ● External Capacity Building ● Administration
Construction	● Monitoring ● Avoidance and Minimization Methods
Operations and Maintenance	● Monitoring ● Avoidance and Minimization Methods
Decommissioned	● Decommissioned

We evaluated EPRI's existing bat database by calculating basic summary statistics based on project size, USFWS region, and the number of species listed in the HCP.

2. Results - Evaluation of EPRI's Bat Data

EPRI's dataset includes 23 HCPs from the years 2006 - 2020, featuring six endangered bat species: the Hawaiian hoary bat, the Indiana bat, the Northern long-eared bat, the Tricolored bat, and the Virginia big-eared bat. Their HCPs largely represent wind energy projects, ranging from 111-520,000 acres in size, but there was one pipeline project included at 9.8 million acres. These HCPs represented three of eight

USFWS regions, with the most coming from the Great Lakes Region (n=14) and fewer coming from the Pacific (n=6) and the Northeast (n=3). It's unclear whether this geographic bias is due to a disproportionate number of applicants in this region submitting bat-related HCPs, or if this is the result of disproportionate reporting from these regions. Finally, 83% of these HCPs were multispecies, with 68% of those being bat-only HCPs.

3. Materials and Methods - Defenders of Wildlife HCP Repository

Shortly after EPRI completed their research, the Defenders of Wildlife (DOW) unveiled the largest repository of HCPs ever made available to the public with 654 HCPs representing 158 different threatened and endangered species (Carter et al., 2021). 139 of these HCPs were gathered from various USFWS websites using data scraping. This included both the federal headquarters and the regional offices which occasionally post separately from ECOS. The remaining HCPs were acquired from a U.S. Freedom of Information Act (FOIA) request for HCPs that were listed in the ECOS database but without downloadable documents. This database is fully available online and includes final HCPs and amendments, final ITPs, monitoring reports, final biological opinions and amendments, implementing agreements, GIS files, and other relevant documents.

We used R Statistical Software (Version 2023.03.0+386) to explore this new source of HCPs for potential research opportunities for EPRI and their membership. We totalled the number of HCPs that included each of the 1488 terrestrial animal species listed on the USFWS's website. Summary statistics were calculated by taxon and by region. We also evaluated these species based on listing year to ensure that frequency of representation in this HCP repository was not a function of how long a species has been on

the ESA. This analysis did not include species that were included in HCPs that are not yet included as threatened or endangered on the ESA.

4. Results - Evaluation of Defender's Database

The DOW repository represents seven of eight USFWS regions, with no HCPs coming from Alaska. It is not mandatory for regional offices to make HCP information accessible in the ECOS database, so it's likely that this is not necessarily a representation of where companies are applying for HCPs but instead influenced by where data is more likely to be posted online. However, we can assume this is a better representation of actual HCP applications than EPRI's bat data, due to a much larger sample size.

Table 2. Number of HCPs in the Defenders of Wildlife Repository by U.S. Fish and Wildlife Service Regional Office and the percentage of the repository from each region.

Region	*Name*	*States Represented*	*Count*	*%*
1	Pacific	HI, ID, OR, WA (Territories: AS, GU, MP)	41	6.3
2	Southwest	AZ, NM, OK, TX	174	26.6
3	Midwest	IL, IN, IA, MI, MN, MO, OH, WI	14	2.1
4	Southeast	AL, AR, FL, GA, KY, LA, MS, NC, SC, TN, (Territories: PR, VI)	210	32.1
5	Northeast	CT, DE, DC, MA, ME, NH, NJ, NY, PA, RI, VA, VT, WV	12	1.8
6	Mountain-Prairie	CO, KS, MT, NE, ND, SD, UT, WY	34	5.2
7	Alaska	AK	0	0
8	Pacific Midwest	CA, NV	169	25.8

There appears to be a bias for the southern regions, with nearly a third of the HCPs (n=210) coming from the Southeast alone. There is higher biodiversity in the Southern half of the United States based on warmer climates, which may mean there's simply more species to include in HCPs in these regions. But this distribution across regions is also partially influenced by a few field offices with disproportionate numbers of HCPs available online. Region Four, the Southeast, has fourteen field offices represented while all the other regions range from 4-8 field offices. The top five field offices with the most HCPs are listed in Table 3 below, and the breakdown across all field offices can be found in Appendix Table A3. Of the 52 field offices included in the repository, 40.4% only have one HCP included.

Table 3. Top five field offices according to the number of HCPs with state and region listed.

Field Office	*State*	*Region*	*Number of HCPs*
Austin Ecological Services Field Office	TX	2	162
Alabama Ecological Services Field Office	AL	4	84
Carlsbad Fish and Wildlife Office	CA	8	58
North Florida Ecological Services Field Office	FL	4	57
Sacramento Fish and Wildlife Office	CA	8	53

The HCPs included in the DOW repository included 158 different species, 23.8% of which were mammals (n=384). However, these species only represent 8% of all mammal species listed as threatened or endangered under the ESA. Mammals were also the most frequently included taxon in the repository with 32.3% of species. A breakdown by taxon can be seen below in Table 4.

Table 4. Threatened and endangered species represented in the Defenders of Wildlife database, categorized by taxa. Species count is the number of individual species from that taxa while occurrence is the number of times a species from that taxa appears in the DOW database (ie. species that occur in multiple HCPs are counted for each HCP).

Taxa	**Species Count**	**% of Species in DOW Database**	**No. of Listed Species**	**% of Species Listed Under ESA**	**Occurrence in DOW database**	**% of Occurrences in DOW database**
Amphibians	11	8.5%	48	23%	119	18.5%
Arachnids	5	3.8%	16	31%	19	3.0%
Clams	2	1.5%	126	2%	2	0.3%
Crustaceans	10	7.7%	30	33%	28	4.4%
Fishes	26	20.0%	212	12%	60	9.3%
Insects	29	22.3%	101	29%	111	17.3%
Mammals	31	23.8%	384	8%	208	32.3%
Reptiles	13	10.0%	145	9%	89	13.8%
Snails	3	2.3%	54	6%	7	1.1%

Taxa more frequently included in this repository could indicate a bias within HCP applications or it could reflect a bias in the ESA more generally. For example, there are only five arachnid species included in the DOW repository, but this is 31% of all arachnids listed under the ESA, indicating that the bias may be within the Act itself and not within HCP applications. Across all taxa, the species included in HCPs in the DOW repository do not represent the majority of species listed as threatened or endangered under the ESA, as indicated below in Figure 1.

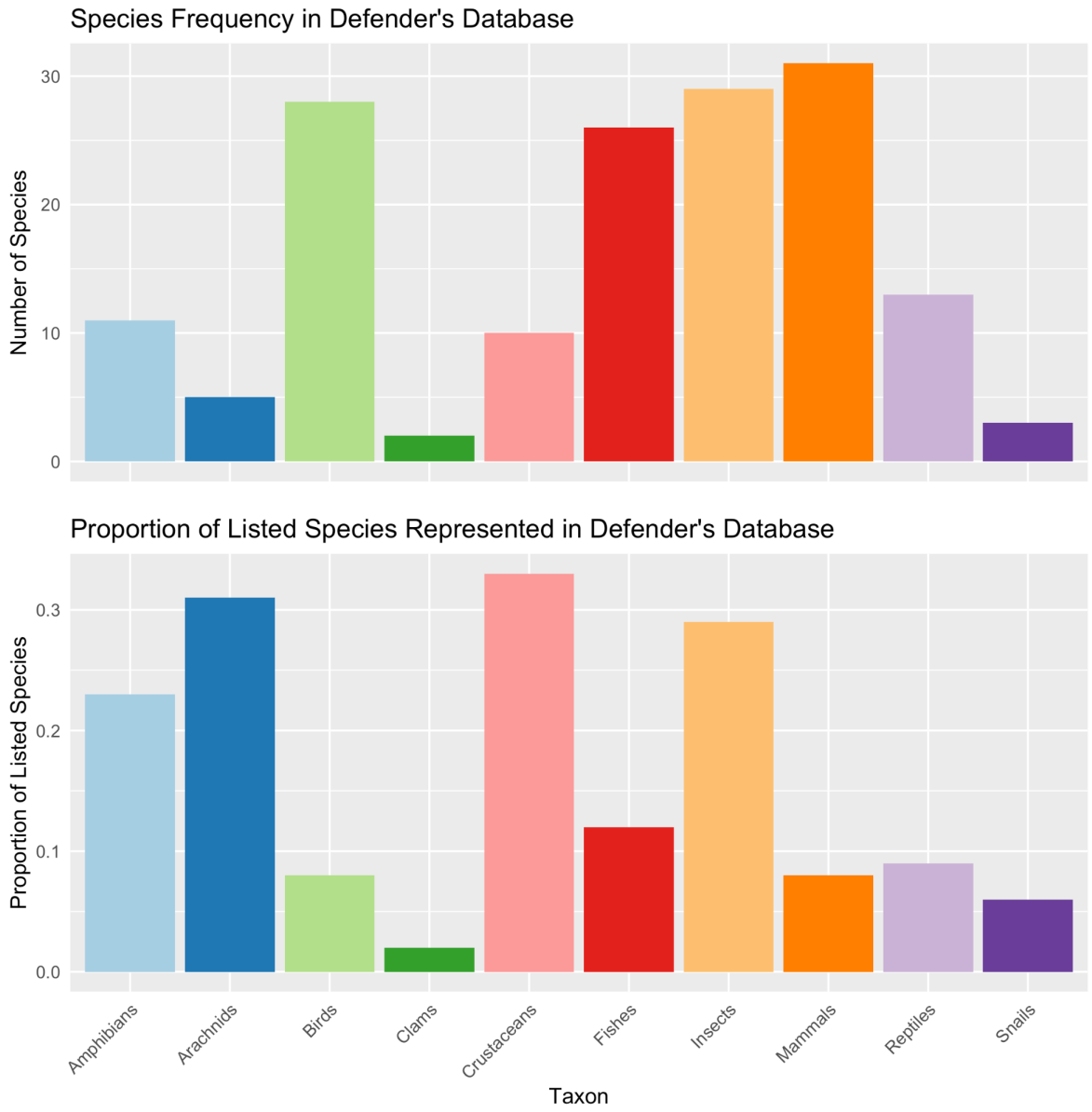

Figure 1. Number of species represented in the Defenders of Wildlife HCP repository by taxon and the proportion of species listed as threatened or endangered under the ESA that number represents.

The most frequently represented taxa are not necessarily indicative of the most frequent species. The top ten species most frequently found within the DOW HCPs across all taxa are listed in Table 5 below, with a full table of species frequency found in Appendix Table A4.

Table 5. Top ten species most frequently represented in the Defenders of Wildlife HCP Repository and the number of HCPs the species appeared in. Species with stars indicate their appearance in an energy industry-related HCP.

Scientific Name	Common Name	Species Group	Status	Count
Bufo houstonensis	Houston toad	Amphibians	Endangered	66
Aphelocoma coerulescens	Florida scrub-jay	Birds	Threatened	65
Peromyscus polionotus ammobates	Alabama beach mouse	Mammals	Endangered	60
Polioptila californica californica	Coastal California gnatcatcher***	Birds	Threatened	29
Gopherus agassizii	Desert tortoise***	Reptiles	Threatened	24
Picoides borealis	Red-cockaded woodpecker	Birds	Endangered	21
Desmocerus californicus dimorphus	Valley elderberry longhorn beetle	Insects	Threatened	20
Vulpes macrotis mutica	San Joaquin kit fox***	Mammals	Endangered	20
Rana draytonii	California red-legged frog***	Amphibians	Threatened	19
Zapus hudsonius preblei	Preble's meadow jumping mouse	Mammals	Threatened	19
*A full list of species can be found in Appendix Table A4.				

The HCP program has been active for multiple decades and new species are added to the ESA every year. Therefore, it's important to ensure that a species' frequency is not simply a function of how long that species has been listed as threatened or endangered under the ESA. While all of the top ten species included in Table 5 were listed before the year 2000, there is no statistically significant correlation between a species listing year and the number of HCPs including that species ($p = 0.2$, 95% CI [-0.18, 0.04]). This relationship is visualized in Figure 2 and grouped by taxon.

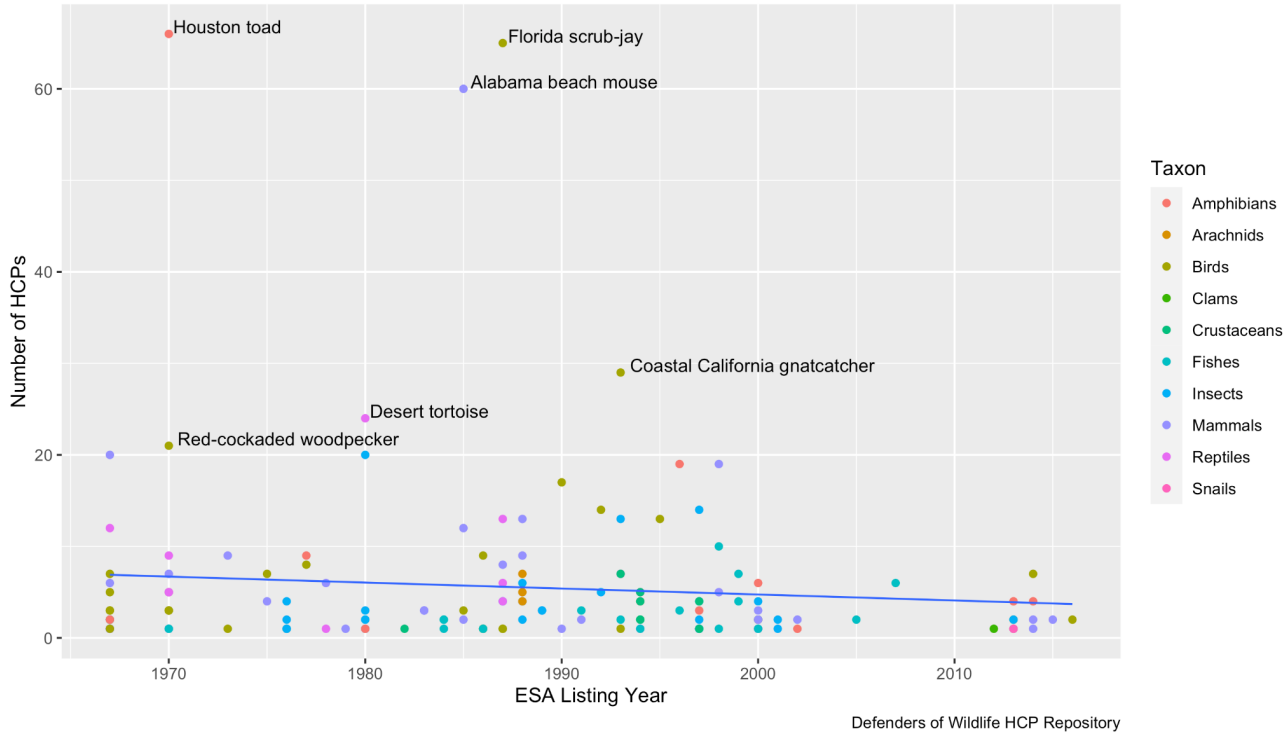

Figure 2. Number of HCPs including a threatened or endangered species by that species' listing year under the Endangered Species Act, grouped by taxon. The blue line represents the linear relationship between these two variables (p=0.02, 95% CI [-0.18, 0.04]).

5. Results - Automating the Analysis

In addition to evaluating available data, a core deliverable was to expand and automate the analysis so these new sources of data can be easily explored to their fullest potential. EPRI's original analysis took the categorized costs, adjusted for inflation using an external website, and calculated average costs across the above-listed conservation activities.This was done manually through Excel. We created an R Code file that takes a limited number of user inputs and makes the same calculations as EPRI originally conducted in Excel plus more. The code then outputs a folder with cleaned and subset data files, summary statistics, tests of statistical significance, basic maps, and relevant figures. This analysis is simplified and annotated in detail to ensure that users with any level of R experience can create sophisticated figures.

A complete outline of the tool's inputs, calculations, and outputs can be seen below in Table 6.

Table 6. User inputs for HCP cost estimate R Code, automated calculations, and final outputs.

Inputs	*Calculations / Operations*	*Outputs*
Data location Relevant column names Species Names Take Unit Current Year	Standardizing categorical data to remove common typos Adjusts for inflation assuming a 5% future inflation rate Average cost by… - USFWS Region - State - Programmatic or Not - Conservation stage - Conservation category - Species - Single or multi-species Relevant summary statistics Tests of statistical significance	Subset data files Tables of summary statistics Summary tables of average cost Maps by state and region Plots of cost distribution

6. Results - Reproducible R Code

The reproducible R Code tool was tested using EPRI's existing bat dataset after cleaning, checking, and reorganizing the data. This code will be given to EPRI as an R File for their future use as they continue to collect more and better data. The outputs listed in Table 6 were not included in this report because EPRI's existing bat dataset is too small for this style of data visualization. Including figures with this small of a sample size would not accurately depict the final output from this tool.

Limitations of HCP Research

Understanding relevant conservation costs streamlines and expedites conservation, making it easier for companies to more comprehensively estimate what it will take to comply with the ESA. Despite their numerous limitations, HCPs are still the most straightforward way to estimate these costs. One alternative method would be to reach out to companies individually to figure out how much they spent on various conservation activities associated with the ESA. While these figures would be more accurate representations of what is actually spent, this would be a much more time-intensive process. EPRI's research into compliance costs using HCPs has never been done before, and with that novelty comes some limitations that need to be addressed.

One concern we were not able to address in our research is the multi-species nature of many HCPs. As discussed earlier, Clinton's No Surprise Rule incentivizes applicants to include as many species as feasible and sometimes even include species that are not yet listed but expected to become listed. The applicant is effectively locked in for the conservation and financial commitments they outline in the HCP and cannot be expected to invest more money or revisit the stipulations of their permit in the case of unforeseen circumstances. Therefore, multispecies HCPs are incredibly common even though there is little evidence that multispecies HCPs are more effective than single-species HCPs (Langpap and Kerkvliet, 2012). Similarly, the trend to include more species persists even if the company is not certain a given species lives on their land. In fact, research indicates that the presence of a species within a given HCP planning area wasn't confirmed in 41% of studied HCPs (Rahn et al., 2006). But it's rare for applicants to break down implementation costs by activity, let alone by species. This lack of specificity makes it challenging to get a species-specific estimate of average cost.

While the pre-implementation activities may be more expensive for multispecies HCPs (more biological surveys, consultants, etc.), many of the implemented conservation actions would likely be similar regardless of whether the action benefits one species or two. HCPs promote habitat-level conservation which, by nature, can benefit every species within the project area (except in rarer cases when the conservation needs of two species may be in conflict in one region). In fact, even single-species HCPs have co-benefits, because the entire habitat benefits when applicants invest in local conservation. Therefore, unless the HCP expresses something to the contrary, we can assume the total cost of a given conservation activity is also the cost to conserve each species within the plan. Ideally HCPs would someday be written in a way that's conducive for breaking these costs down into more accurate, species-specific estimates, but there's simply not enough specificity in HCPs as they are currently written.

This assumption may break down somewhat when we consider the biases inherent in HCPs and in the ESA more generally. Do the conservation activities within an HCP favor one listed species over another? This alludes to the persistent question throughout our research regarding where bias exists. The HCPs available to us through the DOW repository and the ECOS database include only a small fraction of species listed under the ESA, and some are heavily favored more than others. Is this the result of those species being included in more HCPs? Or are those HCPs just more likely to be online? Similarly, some of the field offices have over a hundred HCPs in the DOW repository while most have only one. Are these field offices accepting more applications than others, or are they just more prudent about getting them posted online? We know what's available online does not represent all of the HCPs that have been filed and approved across the country, but we lack an understanding of how representative these online repositories are. Assumedly there's bias at every level of the process, compounded by the biases inherent in the ESA itself which is notorious for its favor of cute, charismatic megafauna that easily garner public approval to be listed.

These biases are further exacerbated with the impact of varied enforcement. We know that HCPs are more likely in areas where Section 9 prohibition on take is the strictest (Anderson and Yaffee, 1998). We also know that some industries come under more scrutiny than others when it comes to enforcement of HCPs or the ESA more generally (whether or not that added scrutiny is justified). For instance, farmers rarely apply for ITPs despite the clear impact agriculture can have on local ecosystems and species. Sure there are some areas and industries where it's easier to avoid incidental take, and maybe people are more likely to choose avoidance or risk enforcement in those areas, but we also cannot deny the role played by disproportionate enforcement. If you feel no risk associated with breaking the rules, you have no incentive to follow them.

All of these limitations are just within the scope of the HCP itself, but our research began to tease out some of the necessary information not included within these documents. HCPs address all of the costs that come after an ITP is finalized and signed, but the pre-implementation costs are significant. Staff can spend months if not years creating these plans. Consultants need to be hired, biologists and legal aides need to be consulted, and there is a large opportunity cost of stalling multi-billion dollar energy projects. None of this information is included in an HCP but they do weigh heavily into a company's personal benefit-cost analysis to determine if they should apply for an ITP or simply risk enforcement. If the process is too onerous (or even if it *feels* too onerous based on limited information about anticipated costs) then they may forgo the process entirely.

We quickly learned that estimating pre-implementation costs was not a straightforward process. There is not a strong understanding of what pre-implementation costs are, let alone adequate tracking for in-kind time spent on HCP planning or expenses for outside consultations. These estimates have to be teased out

of applicants by carefully defining pre-implementation activities and guiding people's thinking through specific scenarios. This understanding of the challenges of estimating pre-implementation costs guided our creation of the pilot survey for EPRI's membership, discussed in more detail below.

Future Recommendations

1. Survey of Pre-Implementation Costs

First, EPRI can test the created pilot survey and send it to a range of EPRI members. The use of a pilot survey can minimize problems, improve quality, and feasibility of the larger survey or main study (In, 2017). Choosing not to complete a pilot survey first can diminish the resulting data and survey questions; therefore, sending a pilot to just one member is better than none. According to past research, pilot surveys should be sent between 30 - 100 participants, depending on how large the entire study sample will be (Zukerberg, et. al., 1995). We recommended sending this pilot survey to 30 participants: 15 electric power companies and 15 consultants. The results can then be analyzed, but can also be used to improve the survey for wider distribution.

We recommended that EPRI use the responses from the pilot survey to inform a future survey. Using pilot responses, EPRI can alter the questions for a larger future survey. The survey allows participants to choose scenarios, and EPRI can use pilot responses to get a sense of common scenarios among their members. If there are common themes in their responses, EPRI can choose to expand on the common scenarios and provide more of these scenarios for their members to choose from during the broader survey.

Ideally, the future survey would be sent to a large quantity of differing non-federal parties to gather a mass amount of data. Since HCPs occur under Section 10, only non-federal parties will need to be surveyed since federal agencies follow Section 7 compliance. We recommend sending the large study/survey to the entire EPRI membership, but if not, it should be sent to at least 200 participants: split 100 in industry and 100 outside consultants. For survey responses to be marginally accurate, 100 responses are needed, but 200 are preferred (Great Brook, n.d.). Therefore, sending the survey to the entire U.S. based EPRI membership would be the most beneficial.

Once this large survey finishes, survey analysis needs to occur so that EPRI can better understand pre-implementation cost differences under different scenarios.

Additionally, standardizing costs across states would be beneficial and allow a clear comparison between states' costs. Additionally, asking about hours spent on certain pre-implementation activities is important, but would need to also be standardized across company sizes (number of employees, ability to hire more contracted consultants, etc.).

2. Policy Recommendations towards a Central Database

It quickly became clear to us that the biggest obstacle to continuing EPRI's work is lack of available HCPs and an even bigger lack of HCPs with specific cost breakdowns. Even with DOW's new HCP repository, there are very few species with enough HCPs to meet traditional standards of statistical significance (where $n>30$). DOW set a precedent that HCP data can be acquired through the Freedom of Information Act, and that could be used again to further expand access. However, ideally these HCPs would be proactively accessible online through the USFWS ECOS database. These documents are

publicly accessible and there's no confidentiality that's required for these projects. Therefore, it may be more worthwhile for EPRI to leverage their membership and their existing relationships with the USFWS to encourage field offices to regularly upload finalized documents. The USFWS is currently in the process of updating ECOS' user interface, which could make it easier for staff to upload these documents (or could come with a learning curve that stalls the transfer of data). Proactive data sharing could also be mandated by Congress through an authorization bill, if necessary, though EPRI would have to consider the benefits and costs associated with lobbying for that legislation versus more informal avenues of acquiring HCPs. In the meantime, it's prudent for EPRI to continue building their own internal HCP databases guided by the below recommendations.

3. Data Scraping and Machine Learning

EPRI and the researchers from the University of Arizona collected their bat data manually by reading through HCPs to find relevant cost information. However, this is an incredibly time-intensive process, as these documents can be over a hundred pages long. EPRI can expedite this process by using data scraping technologies to pull out this cost information and then machine learning techniques to categorize costs into the different groupings of conservation activities listed above in Table 1. However, this process would be made challenging by the extreme variability in formatting between HCPs. Unfortunately, the more variability is present between HCPs, the more that are needed to adequately train the model. There may not be sufficient HCPs available in the DOW repository to accomplish this.

4. Species Recommendation

The DOW repository unfortunately did not add additional bat HCPs to build on EPRI's existing data as they had hoped, and the amount currently available is not sufficient to meet traditional standards for statistical significance (n>30) if just focused on bats and wind turbines. Fortunately, EPRI can pair similar species to create larger sample sizes (as they did when they paired several bat species together for their original research) or they can choose a different study taxon with more available HCPs. Appendix Table A5 lists the species included energy-related HCPs, along with the keyword search from that HCP's title.

5. Search Engine

Originally, EPRI wanted to create a cost calculator tool; however we recommend switching from the creation of a cost calculator to a search engine instead. If companies utilized a cost calculator tool that would estimate their project's costs, there is a potential for the estimation to be wrong. A wrong estimation can provide the company with a false perception and hinder their HCP planning process. We want to ensure the transparent costs are useful and overall beneficial for project planning.

Therefore, we are recommending the creation of a search engine. The purpose of this tool is to still provide cost data, but not give the company direct estimates. The company can search for cost data associated with specific inputs: energy type, location, species, and/or pre-implementation activity. The outputs generated would include published HCPs or survey responses that are associated with the keywords they inputted. The published HCPs can give the company implementation cost data and the

survey responses can provide the company with estimates for pre-implementation activities. The search engine can be easily updated as more HCPs are published and more surveys are conducted. This tool would also make cost data extremely easy to find.

6. *Future Research*

This research into compliance costs using HCPs is very novel, thus catapulting EPRI to the forefront of the field. EPRI has the option to continue along the path they're currently taking, pulling relevant data and calculating cost estimates, or they could go in any number of new directions. Some additional relevant study questions not originally included in the scope of their research include:

- Are the costs listed in HCPs reflective of what is ultimately spent on the conservation actions?
- Are multispecies HCPs more expensive to design and implement than single species HCPS?
- How closely does the sample of HCPs available in the DOW repository and ECOS resemble the distribution of actual HCP applications?
- What are the primary contributing factors influencing whether or not an applicant files an HCP and/or includes a given species in their HCP?
- What's an applicant's willingness to pay to avoid enforcement under the ESA and to what extent is that number influenced by perceived severity of enforcement by local field offices?

7. *Benefit Cost Analysis*

As these cost data are collected and refined, doors begin to open for more comprehensive analyses with benefit-cost analysis being chief among future targets. Once EPRI has a stronger estimate of both

pre-implementation and implementation costs, we can begin evaluating how those costs stack up against other opportunity costs and against the perceived benefits of complying (or not complying) with the ESA. Again, our research and any future analyses is not intended to make recommendations for or against the ESA, but instead to evaluate whether HCPs are an effective mechanism for incidental take and economic development. How much is the company willing to pay to avoid punishment under the ESA? We can begin to better understand the efficiency of the HCP program. High compliance costs might incentivize companies to invest in species conservation before species become listed or early on in their listing. The closer EPRI can get to a full benefit-cost analysis, the better the result for both companies and the species they're working to protect.

APPENDIX

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Table A1. Relevant abbreviations

Full Word	Abbreviation
Endangered Species Act	ESA
Habitat Conservation Plan(s)	HCP(s)
Incidental Take Permit(s)	ITP(s)
United States Fish and Wildlife Service	USFWS
National Oceanic and Atmospheric Administration	NOAA
The Convention on International Trade in Endangered Species of Wild Fauna and Flora	CITES
International Union for Conservation of Nature	IUCN
National Environmental Policy Act	NEPA
Environmental Assessment	EA
Environmental Impact Statement	EIS

Table A2. The 17 Sections of the Endangered Species Act Overview. Specific or "key" sections are particularly significant and indicated by a * symbol. The area we focused on, Section 10, is bolded.

Section	Overview
Section 2: Findings, Purpose, and Policy	This Section overviews the intent in enacting it and background information.
Section 3: Definitions*	This Section provides the terms and definitions throughout the Act.
Section 4: Determination of Endangered Species and Threatened Species*	This Section discusses how species are protected by the listing process, defines the listing classifications, and delisting.
Section 5: Land Acquisition	This Section addresses how the government can buy land for conservation purposes.
Section 6: Cooperation with the States	This Section describes the collaboration needed between state agencies and the federal agency for any programs associated with any listed species.

Section (cont.)	Overview
Section 7: Interagency Cooperation*	This Section details how any discrepancies between federal agencies regarding listed species should be handled, and establishes the "Endangered Species Committee." This section details the needed consultations between the USFWS and other federal agencies, when a non-federal agency may "jeopardize" a listed species.
Section 8: International Cooperation	This Section establishes and encourages cooperation between the federal agency with foreign agencies and governments .
Section 9: Prohibited Acts*	This Section details specific actions that would be considered a violation under this Act.
Section 10: Exceptions*	This Section addresses exceptions to prohibitions addressed in Section 9, such as "incidental takes." This section also discusses Incidental Take Permits (ITPs) and Habitat Conservation Plans (HCPs) for non-governmental entities or individuals when "take" of a species is possible.
Section 11: Penalties and Enforcement*	This Section details the consequences of violating the Act.
Section 12: Endangered Plants	This Section focuses on the protection of plants as listed species.
Section 13: Conforming Amendments	The Section includes amendments to other Acts.
Section 14: Repealer	This Section includes repeals to previous Acts.
Section 15: Authorization of Appropriations	This Section includes the authorization for the original funding and reauthorizations of funding through 1992.
Section 16: Effective Date	This Section states how the Act is effective starting on the enactment date.
Section 17: Marine Mammal Protection Act of 1972	This Section addresses how no provision of this Act will take priority over any more restrictive conflicting provision of the Marine Mammal Protection Act of 1972.
Section 18: Annual Cost Analysis by the Fish and Wildlife Service	This Section requires an annual cost accounting by the Secretary of the Interior on a species by species basis.

Table A3. U.S. Fish and Wildlife Service Field Offices and the Number of HCPs from the Defenders of Wildlife Repository from that office.

Field Office (n=number of HCPs)	*State or Territory*	*Number of HCPs*
REGION ONE: Pacific *(n=41) Including HI, ID, OR, WA (Territories: AS, GU, MP)*		
Idaho Fish and Wildlife Office	Idaho	1
Oregon Coastal Field Office, Newport	Oregon	1
Oregon Fish and Wildlife Office	Oregon	11
Pacific Islands Fish and Wildlife Office	Hawaii and Guam	10
Upper Columbia River Fish and Wildlife Office	Washington	1
Washington Fish and Wildlife Office	Washington	17
REGION TWO: Southwest *(n=174) Including AZ, NM, OK, TX*		
Arizona Ecological Services Field Office	Arizona	5
Arizona Ecological Service Field Office - Tucson	Arizona	3
Arlington Ecological Services Field Office	Texas	1
Austin Ecological Services Field Office	Texas	162
East Texas Sub–Office	Texas	1
Mississippi Ecological Services Field Office	Mississippi	1
Oklahoma Ecological Services Field Office	Oklahoma	1
REGION 3: Midwest *(n=14) Including IL, IN, IA, MI, MN, MO, OH, WI*		
Green Bay Ecological Services Field Office	Wisconsin	1
Illinois-Iowa Ecological Services Field Office	Iowa and Illinois	2
Indiana Ecological Services Field Office	Indiana	4
Michigan Ecological Services Field Office	Michigan	3
Minnesota-Wisconsin Ecological Services Field Office	Minnesota and Wisconsin	1
Northern Indiana Ecological Services Sub-Office	Indiana	1
Ohio Ecological Services Field Office	Ohio	2

Field Office (n=number of HCPs) (cont.)	*State or Territory*	*Number of HCPs*
REGION 4: Southeast *(n=210) Including AL, AR, FL, GA, KY, LA, MS, NC, SC (Territories: PR, VI)*		
Alabama Ecological Services Field Office	Alabama	84
Arkansas Ecological Services Field Office	Arkansas	1
Asheville Ecological Services Field Office	North Carolina	2
Brunswick Ecological Services Field Office	North Carolina	1
Caribbean Ecological Services Field Office	Puerto Rico	3
Georgia Ecological Services Field Office	Georgia	1
Louisiana Ecological Services Field Office	Louisiana	1
Mississippi Ecological Services Field Office	Mississippi	4
North Florida Ecological Services Field Office	Florida	57
Panama City Ecological Services Field Office	Florida	13
Raleigh Ecological Services Field Office	North Carolina	2
South Carolina Ecological Services	South Carolina	6
South Florida Ecological Services Field Office	Florida	34
Tennessee Ecological Services Field Office	Tennessee	1
REGION 5: Northeast *(n=12) Including CT, DE, DC, MA, ME, NH, NJ, NY, PA, RI, VA, VT, WV*		
Chesapeake Bay Ecological Services Field Office	Maryland	4
Maine Ecological Services Field Office	Maine	1
New England Ecological Services Field Office	New Hampshire	1
New York Ecological Services Field Office	New York	1
Virginia Ecological Services Field Office	Virginia	3
West Virginia Ecological Services Field Office	West Virginia	2
REGION 6: Mountain-Prairie *(n=34) Including CO, KS, MT, NE, ND, SD, UT, WY*		
Kalispell Ecological Services Field Office	Montana	2
Colorado Ecological Services Field Office	Colorado	19

Field Office (n=number of HCPs) (cont.)	*State or Territory*	*Number of HCPs*
Mountain-Prairie Region	Colorado	1
Utah Ecological Services Field Office	Utah	12
REGION 7: Alaska *(n=0) Including AK*		
REGION 8: Pacific Midwest *(n=169) Including CA, NV*		
Sacramento Fish and Wildlife Office	California	53
Arizona Ecological Services Field Office	Arizona	1
Arcata Fish and Wildlife Office	California	6
Carlsbad Fish and Wildlife Office	California	58
Reno Fish and Wildlife Office	Nevada	6
Southern Nevada Field Office	Nevada	3
Ventura Fish and Wildlife Office	California	41
Yreka Fish and Wildlife Office	California	1

Table A4. Species occurrence in the Defenders of Wildlife database.

Scientific Name	Common Name	Species Group	Status	Count
Bufo houstonensis	Houston toad	Amphibians	Endangered	66
Aphelocoma coerulescens	Florida scrub-jay	Birds	Threatened	65
Peromyscus polionotus ammobates	Alabama beach mouse	Mammals	Endangered	60
Polioptila californica californica	Coastal California gnatcatcher***	Birds	Threatened	29
Gopherus agassizii	Desert tortoise***	Reptiles	Similarity of Appearance to a Threatened Taxon	24
Picoides borealis	Red-cockaded woodpecker	Birds	Endangered	21
Desmocerus californicus dimorphus	Valley elderberry longhorn beetle	Insects	Threatened	20
Vulpes macrotis mutica	San Joaquin kit fox***	Mammals	Endangered	20
Rana draytonii	California red-legged frog***	Amphibians	Threatened	19
Zapus hudsonius preblei	Preble's meadow jumping mouse	Mammals	Threatened	19
Strix occidentalis caurina	Northern spotted owl	Birds	Threatened	17

Scientific Name (cont.)	Common Name	Species Group	Status	Count
Brachyramphus marmoratus	Marbled murrelet	Birds	Threatened	14
Polyphylla barbata	Mount Hermon June beetle	Insects	Endangered	14
Empidonax traillii extimus	Southwestern willow flycatcher***	Birds	Endangered	13
Rhaphiomidas terminatus abdominalis	Delhi Sands flower-loving fly***	Insects	Endangered	13
Dipodomys stephensi (incl. D. cascus)	Stephens' kangaroo rat***	Mammals	Threatened	13
Neoseps reynoldsi	Sand skink	Reptiles	Threatened	13
Peromyscus polionotus trissyllepsis	Perdido Key beach mouse	Mammals	Endangered	12
Gambelia silus	Blunt-nosed leopard lizard***	Reptiles	Endangered	12
Salvelinus confluentus	Bull Trout	Fishes	Experimental Population, Non-Essential	10
Phaeognathus hubrichti	Red Hills salamander	Amphibians	Threatened	9
Vireo bellii pusillus	Least Bell's vireo***	Birds	Endangered	9
Cynomys parvidens	Utah prairie dog	Mammals	Threatened	9
Dipodomys nitratoides nitratoides	Tipton kangaroo rat***	Mammals	Endangered	9
Lepidochelys kempii	Kemp's ridley sea turtle	Reptiles	Endangered	9
Lanius ludovicianus mearnsi	San Clemente loggerhead shrike	Birds	Endangered	8
Dipodomys ingens	Giant kangaroo rat***	Mammals	Endangered	8
Texella reyesi	Bone Cave harvestman	Arachnids	Endangered	7
Coccyzus americanus	Yellow-billed Cuckoo	Birds	Threatened	7
Pterodroma sandwichensis	Hawaiian petrel	Birds	Endangered	7
Puffinus auricularis newelli	Newell's Townsend's shearwater***	Birds	Threatened	7
Streptocephalus woottoni	Riverside fairy shrimp***	Crustaceans	Endangered	7
Oncorhynchus (=Salmo) tshawytscha	Chinook salmon	Fishes	Endangered	7
Lasiurus cinereus semotus	Hawaiian hoary bat***	Mammals	Endangered	7
Thamnophis gigas	Giant garter snake	Reptiles	Threatened	7
Ambystoma californiense	California tiger Salamander	Amphibians	Endangered	6
Oncorhynchus (=Salmo) mykiss	Steelhead	Fishes	Endangered	6
Rhadine persephone	Tooth Cave ground beetle	Insects	Endangered	6
Canis lupus	Gray wolf	Mammals	Endangered	6
Myotis sodalis	Indiana bat***	Mammals	Endangered	6
Eumeces egregius lividus	blue-tailed mole skink	Reptiles	Threatened	6
Texella reddelli	Bee Creek Cave harvestman	Arachnids	Endangered	5
Branta (=Nesochen) sandvicensis	Hawaiian goose ***	Birds	Threatened	5
Himantopus mexicanus knudseni	Hawaiian stilt***	Birds	Endangered	5

Scientific Name (cont.)	Common Name	Species Group	Status	Count
Branchinecta lynchi	Vernal pool fairy shrimp	Crustaceans	Threatened	5
Lycaeides melissa samuelis	Karner blue butterfly	Insects	Endangered	5
Dipodomys merriami parvus	San Bernardino Merriam's kangaroo rat	Mammals	Endangered	5
Dermochelys coriacea	Leatherback sea turtle	Reptiles	Endangered	5
Eretmochelys imbricata	Hawksbill sea turtle	Reptiles	Endangered	5
Helminthoglypta walkeriana	Morro shoulderband (=Banded dune) snail	Snails	Threatened	5
Anaxyrus californicus	Arroyo (=arroyo southwestern) toad***	Amphibians	Endangered	4
Eurycea tonkawae	Jollyville Plateau Salamander	Amphibians	Threatened	4
Rana pretiosa	Oregon spotted frog	Amphibians	Threatened	4
Tartarocreagris texana	Tooth Cave pseudoscorpion	Arachnids	Endangered	4
Branchinecta sandiegonensis	San Diego fairy shrimp***	Crustaceans	Endangered	4
Lepidurus packardi	Vernal pool tadpole shrimp	Crustaceans	Endangered	4
Oncorhynchus keta	Chum salmon	Fishes	Threatened	4
Euphilotes enoptes smithi	Smith's blue butterfly	Insects	Endangered	4
Euphydryas editha bayensis	Bay checkerspot butterfly***	Insects	Threatened	4
Euphydryas editha quino (=E. e. wrighti)	Quino checkerspot butterfly***	Insects	Endangered	4
Icaricia icarioides fenderi	Fender's blue butterfly	Insects	Threatened	4
Texamaurops reddelli	Kretschmarr Cave mold beetle	Insects	Endangered	4
Ursus arctos horribilis	Grizzly bear	Mammals	Threatened	4
Gopherus polyphemus	Gopher tortoise	Reptiles	Threatened	4
Eurycea sosorum	Barton Springs salamander	Amphibians	Endangered	3
Charadrius melodus	Piping Plover	Birds	Endangered	3
Fulica americana alai	Hawaiian coot***	Birds	Endangered	3
Gallinula galeata sandvicensis	Hawaiian common gallinule***	Birds	Endangered	3
Gymnogyps californianus	California condor***	Birds	Endangered	3
Rallus longirostris levipes	Light-footed clapper rail***	Birds	Endangered	3
Sterna antillarum browni	California least tern***	Birds	Endangered	3
Oncorhynchus (=Salmo) kisutch	Coho salmon	Fishes	Endangered	3
Xyrauchen texanus	Razorback sucker	Fishes	Endangered	3
Nicrophorus americanus	American burying beetle	Insects	Experimental Population, Non-Essential	3
Nicrophorus americanus	American burying beetle	Insects	Threatened	3
Speyeria zerene hippolyta	Oregon silverspot butterfly	Insects	Experimental Population	3

Scientific Name (cont.)	Common Name	Species Group	Status	Count
Lynx canadensis	Canada Lynx	Mammals	Threatened	3
Neotoma floridana smalli	Key Largo woodrat	Mammals	Endangered	3
Peromyscus gossypinus allapaticola	Key Largo cotton mouse	Mammals	Endangered	3
Ambystoma macrodactylum croceum	Santa Cruz long-toed salamander	Amphibians	Endangered	2
Cicurina madla	Madla Cave Meshweaver	Arachnids	Endangered	2
Anas wyvilliana	Hawaiian (=koloa) Duck***	Birds	Endangered	2
Eremophila alpestris strigata	Streaked Horned lark	Birds	Threatened	2
Oceanodroma castro	Band-rumped storm-petrel	Birds	Endangered	2
Sterna dougallii dougallii	Roseate tern***	Birds	Endangered	2
Branchinecta conservatio	Conservancy fairy shrimp	Crustaceans	Endangered	2
Branchinecta longiantenna	Longhorn fairy shrimp	Crustaceans	Endangered	2
Gila cypha	Humpback chub	Fishes	Threatened	2
Gila elegans	Bonytail	Fishes	Endangered	2
Gila purpurea	Yaqui chub	Fishes	Endangered	2
Hypomesus transpacificus	Delta smelt	Fishes	Threatened	2
Ictalurus pricei	Yaqui catfish	Fishes	Threatened	2
Oncorhynchus (=Salmo) nerka	Sockeye salmon	Fishes	Endangered	2
Poeciliopsis occidentalis	Gila topminnow (incl. Yaqui)	Fishes	Endangered	2
Batrisodes texanus	Coffin Cave mold beetle	Insects	Endangered	2
Cicindela ohlone	Ohlone tiger beetle	Insects	Endangered	2
Euphydryas editha taylori	Taylor's (=whulge) Checkerspot	Insects	Endangered	2
Glaucopsyche lygdamus palosverdesensis	Palos Verdes blue butterfly	Insects	Endangered	2
Heraclides aristodemus ponceanus	Schaus swallowtail butterfly	Insects	Endangered	2
Rhadine exilis	[no common name] Beetle	Insects	Endangered	2
Rhadine infernalis	[no common name] Beetle	Insects	Endangered	2
Trimerotropis infantilis	Zayante band-winged grasshopper	Insects	Endangered	2
Aplodontia rufa nigra	Point Arena mountain beaver	Mammals	Endangered	2
Myotis septentrionalis	Northern Long-Eared Bat***	Mammals	Threatened	2
Peromyscus polionotus allophrys	Choctawhatchee beach mouse	Mammals	Endangered	2
Sorex ornatus relictus	Buena Vista Lake ornate Shrew	Mammals	Endangered	2
Sylvilagus bachmani riparius	Riparian brush rabbit	Mammals	Endangered	2
Thomomys mazama pugetensis	Olympia pocket gopher	Mammals	Threatened	2
Eurycea nana	San Marcos salamander	Amphibians	Threatened	1
Rana chiricahuensis	Chiricahua leopard frog	Amphibians	Threatened	1

Scientific Name (cont.)	Common Name	Species Group	Status	Count
Cicurina vespera	Government Canyon Bat Cave meshweaver	Arachnids	Endangered	1
Caprimulgus noctitherus	Puerto Rican nightjar***	Birds	Endangered	1
Falco femoralis septentrionalis	Northern Aplomado Falcon	Birds	Endangered	1
Grus americana	Whooping crane	Birds	Endangered	1
Strix occidentalis lucida	Mexican spotted owl	Birds	Threatened	1
Lampsilis higginsii	Higgins eye (pearlymussel)	Clams	Endangered	1
Plethobasus cyphyus	Sheepnose Mussel	Clams	Endangered	1
Antrolana lira	Madison Cave isopod***	Crustaceans	Threatened	1
Gammarus hyalleloides	Diminutive Amphipod	Crustaceans	Endangered	1
Orconectes shoupi	Nashville crayfish	Crustaceans	Endangered	1
Stygobromus (=Stygonectes) pecki	Peck's cave amphipod	Crustaceans	Endangered	1
Catostomus santaanae	Santa Ana sucker	Fishes	Threatened	1
Cyprinella formosa	Beautiful shiner	Fishes	Threatened	1
Cyprinodon elegans	Comanche Springs pupfish	Fishes	Endangered	1
Empetrichthys latos	Pahrump poolfish	Fishes	Endangered	1
Etheostoma fonticola	Fountain darter	Fishes	Endangered	1
Eucyclogobius newberryi	Tidewater goby	Fishes	Endangered	1
Gambusia georgei	San Marcos gambusia	Fishes	Endangered	1
Gambusia nobilis	Pecos gambusia	Fishes	Endangered	1
Gasterosteus aculeatus williamsoni	Unarmored threespine stickleback	Fishes	Endangered	1
Meda fulgida	Spikedace	Fishes	Endangered	1
Notropis topeka (=tristis)	Topeka shiner	Fishes	Endangered	1
Ptychocheilus lucius	Colorado pikeminnow	Fishes	Endangered	1
Tiaroga cobitis	Loach minnow	Fishes	Endangered	1
Batrisodes venyivi	Helotes mold beetle	Insects	Endangered	1
Callophrys mossii bayensis	San Bruno elfin butterfly	Insects	Endangered	1
Heterelmis comalensis	Comal Springs riffle beetle	Insects	Endangered	1
Icaricia icarioides missionensis	Mission blue butterfly	Insects	Endangered	1
Manduca blackburni	Blackburn's sphinx moth***	Insects	Endangered	1
Pseudocopaeodes eunus obscurus	Carson wandering skipper	Insects	Endangered	1
Speyeria callippe callippe	Callippe silverspot butterfly	Insects	Endangered	1
Speyeria zerene behrensii	Behren's silverspot butterfly	Insects	Endangered	1
Corynorhinus (=Plecotus) townsendii virginianus	Virginia big-eared bat***	Mammals	Endangered	1

Scientific Name (cont.)	Common Name	Species Group	Status	Count
Odocoileus virginianus clavium	Key deer	Mammals	Endangered	1
Odocoileus virginianus leucurus	Columbian white-tailed deer	Mammals	Threatened	1
Perognathus longimembris pacificus	Pacific pocket mouse***	Mammals	Endangered	1
Puma (=Felis) concolor coryi	Florida panther	Mammals	Endangered	1
Reithrodontomys raviventris	Salt marsh harvest mouse	Mammals	Endangered	1
Sylvilagus palustris hefneri	Lower Keys marsh rabbit	Mammals	Endangered	1
Thomomys mazama yelmensis	Yelm pocket gopher	Mammals	Threatened	1
Urocitellus brunneus	Northern Idaho Ground Squirrel	Mammals	Threatened	1
Crotalus willardi obscurus	New Mexican ridge-nosed rattlesnake	Reptiles	Threatened	1
Masticophis lateralis euryxanthus	Alameda whipsnake (=striped racer)	Reptiles	Threatened	1
Thamnophis sirtalis tetrataenia	San Francisco garter snake	Reptiles	Endangered	1
Uma inornata	Coachella Valley fringe-toed lizard	Reptiles	Threatened	1
Pyrgulopsis texana	Phantom Springsnail	Snails	Endangered	1
Tryonia cheatumi	Phantom Tryonia	Snails	Endangered	1

Table A5. Species featured in energy-related HCPs based on key-word search. No HCP titles contained the words “solar” or “hydro.”

Search Term	*Species Common Name*
Electric	● Arroyo toad ● Black-capped vireo ● California least tern ● California red-legged frog ● Coastal California gnatcatcher ● Golden-cheeked warbler ● Least Bell’s vireo ● Light-footed clapper rail ● Pacific pocket mouse ● Quino checkerspot butterfly ● Riverside fairy shrimp ● San Diego fairy shrimp ● Southwestern willow flycatcher ● Stephens’s kangaroo rat ● Western snowy plover (not listed as endangered)
Energy	● Blunt-nosed leopard lizard ● Giant kangaroo rat ● Least tern ● San Joaquin kit fox ● Tipton kangaroo rat

Search Term (cont.)	*Species Common Name*
Gas	• Arroyo toad • Blunt-nosed leopard lizard • California condor • California least tern • California red-legged frog • Coastal California gnatcatcher • Giant kangaroo rat • Least Bell's vireo • Light-footed clapper rail • Pacific pocket mouse • Quino checkerspot butterfly • Riverside fairy shrimp • San Diego fairy shrimp • San Joaquin kit fox • Southwestern willow flycatcher • Stephens's kangaroo rat • Western snowy plover (not listed as endangered)
Oil	• Coastal california gnatcatcher
Pipeline	• Blunt-nosed leopard lizard • Giant kangaroo rat • San Joaquin kit fox
Power	• Bay checkerspot butterfly • California red-legged frog • Desert tortoise • Madison Cave isopod
Transmission	• Black-capped vireo • Delhi Sands flower-loving fly • Golden-cheeked warbler
Wind	• Blackburn's sphinx moth • Golden-cheeked warbler • Hawaiian common gallinule • Hawaiian coot • Hawaiian duck • Hawaiian goose • Hawaiian hoary bat • Hawaiian petrel • Hawaiian stilt • Indiana bat • Newell's Towsend's shearwater • Northern long-eared bat • Puerto Rican nightjar • Roseate tern • Virginia big-eared bat

Figure A1. Pilot Survey Questions and Format

Background:

EPRI is continuing to work on gathering helpful cost data associated with Habitat Conservation Plans (HCPs) and Incidental Take Permits (ITPs) under the Endangered Species Act. The next step is to develop a survey method/instrument to capture cost estimates for pre-implementation activities that go into getting the HCP that are generally not captured in the published HCPs.

Pre-implementation activities refer to any activity leading up to getting the ITP issued. Examples will differ depending on your role, but may include: species field surveys, impact and mitigation analysis, writing the HCP, USFWS coordination/consultation, legal services, field work, etc.

Identifier Questions:

Choose a description that best describes your organization

1. Environmental Consultant
2. Electric Power Utility
3. Independent Power Producer
4. Other: _____

What is your title or role in your organization?
What states in the US does your company serve or work? We would have check boxes.
What is your organization's level of experience working on an HCP in the last 10 years?

a. None
b. Low (1 to 3)
c. Medium (4 to 10)
d. High (more than 10)

What is your level of experience working on an HCP in the last 10 years?

a. None
b. Low (1 to 3)
c. Medium (4 to 10)
d. High (more than 10)

The following are project descriptions and scenarios for potential energy-related HCPs. Each of the descriptions will provide some basics of the project that will then follow with some questions where you will be asked to build a scenario where you will be ask questions about costs and timelines to characterize pre-implementation costs. We are asking for estimates only based on your professional experience. Your answers will be combined with other respondents.

For this exercise, pre-implementation activities refer to any activity leading up to getting the HCP/ITP issued. For this survey, they include:

- **Desktop and species field surveys:** This includes all the activities and surveys to collect and assess the data to comply with required or standard species-specific field surveys in order to quantify or characterize "take" for the ITP/HCP.
- **Preparing, writing, and submitting the ITP/HCP:** This includes all the costs of the consultant hired to support the energy company to get to the point where ITP/HCP is issued to the applicant. This would include the costs associated with the consultant supporting USFWS coordination/consultation.
- **Preparing, writing and submitting NEPA documents:** This includes all the costs of the consultant hired to develop and finalize the NEPA analysis and documents for the ITP/HCP. It includes scoping, analyzing, writing, coordinating with USFWS, and getting and reviewing public comments.
- **Outside Legal services:** Some organizations engage with outside counsel to help support the HCP process which may include engage with USFWS, interpreting and defining take, reviewing and writing sections of the HCP, and supporting obtaining necessary agreements and assurances of the ITP/HCP.

Scenarios and Questions

Scenario 1- Solar Project

An energy company is proposing a Solar Project. The applicant proposes to develop and operate a 200-megawatt (MW) ground-mounted solar photovoltaic (PV) power plant on private agricultural lands for 25 years. The project would require a land footprint of approximately 1,400 contiguous acres to site the power plant. The area surrounding the project is predominately grassland. Covered activities involve the construction, operation, maintenance, and eventual decommissioning of the solar energy electrical generation facility. It does not include activities associated with building or maintaining transmission for the project. The project site is approximately 2,500 acres and the study area is about 5,000 acres. The company knows it will need to a Habitat Conservation Plan (HCP) to support an application to the U.S. Fish and Wildlife Service (USFWS) for permits under the federal endangered species act.

If this scenario is not familiar, please skip and proceed to the next Scenario.

1) Based on a typical project in your region or one that you have worked on, what are two wildlife species that could require an incidental take permit (ITP) for the solar project activities?

   a. Species #1: _____
   b. Species #2: _____

For this example, there have been no field studies at the site, but it is assumed that Species #1 has approximately 1,000 acres of potential habitat in the study area. For Species #2, there are records of species in the region but the potential usage or occupancy of Species #2 in the project site and study area is low and likely can be avoided.

Desktop and species field surveys: This includes all the activities and surveys to collect and assess the data to comply with required or standard species-specific field surveys in order to quantify or characterize “take” for the ITP/HCP.

1) What would be the estimated minimum cost that would be budgeted to complete the Desktop and Species Field Surveys? _____

2) What would be the estimated maximum cost that would be budgeted to complete the Desktop and Species Field Surveys? _____

3) Assuming, there was a notice to proceed, and fieldwork could start on January 1, what is the minimum number of months it would take to complete the Desktop and Species Field Surveys? _____

4) Assuming, there was a notice to proceed, and fieldwork could start on January 1, what is the maximum number of months it would take to complete the Desktop and Species Field Surveys? _____

Preparing, writing, and submitting the ITP/HCP: This includes all the costs of the consultant hired to support the energy company to get to the point where ITP/HCP is issued to the applicant. This would include the costs associated with the consultant supporting USFWS coordination/consultation.

1) What would be the estimated minimum cost that would be budgeted to complete the preparing, writing, and submitting of the ITP/HCP by an environmental consultant?

_____

2) What would be the estimated maximum cost that would be budgeted to complete the preparing, writing, and submitting of the ITP/HCP by an environmental consultant?

_____

3) For Environmental Consultants: Estimate the percentage of the total cost that directly relates to supporting and participating in coordination/consultation with USFWS?

_____

4) What is the minimum number of months it would take to complete preparing, writing, and submitting the ITP/HCP? _____

5) What is the maximum number of months it would take to complete preparing, writing, and submitting the ITP/HCP? _____

6) For Energy Companies: What is the estimated minimum full-time equivalents (FTE) that your organization would expect to spend managing and supporting the preparing, writing, and submitting of the ITP/HCP. For example, if a company had two people involved with the ITP/HCP and one person spent 20% of their time and other spent 10% of their time, the FTE would be 0.3? _____

Preparing, writing and submitting NEPA documents: This includes all the costs of the consultant hired to develop and finalize the NEPA analysis and documents for the ITP/HCP. It includes scoping, analyzing, writing, coordinating with USFWS, and getting and reviewing public comments.

1) What would be the estimated minimum cost that would be budgeted to complete the preparing, writing, and submitting of the NEPA documents by an environmental consultant? _____

2) What would be the estimated maximum cost that would be budgeted to complete the preparing, writing, and submitting of the NEPA documents by an environmental consultant? _____

3) What is the minimum number of months it would take to complete preparing, writing, and submitting the NEPA documents? _____

4) What is the maximum number of months it would take to complete preparing, writing, and submitting the NEPA documents? _____

Outside Legal services: Some organizations engage with outside counsel to help support the HCP process which may include engage with USFWS, interpreting and defining take, reviewing and writing sections of the HCP, and supporting obtaining necessary agreements and assurances of the ITP/HCP.

1) Would your organization engage with outside legal services for this type of HCP?

    a. Yes

    b. Maybe

    c. No

2) If yes or maybe: What would be the estimated minimum cost that would be budgeted for outside legal services? _____

3) If yes or maybe: What would be the estimated maximum cost that would be budgeted outside legal services? _____

Other Costs:

1) Are there other large/significant pre-implementation costs that have not been included in the questions above? Yes/No

2) If Yes, what are those type of costs?

3) If Yes, what would total cost range for them?

Scenario 2- Wind Project

An energy company is proposing a wind project. The applicant proposed to develop and operate a wind farm with 150-operating 2.2 MW wind turbines and a net generating capacity of 330 megawatts (MW). The wind farm will be constructed within 40,000 acres of land that is a combination of agriculture and natural habitats. Covered activities involve the construction, operation, maintenance, and eventual decommissioning of the wind energy facility. It does not include activities associated with building or maintaining transmission for the project. The company knows it will need to a Habitat Conservation Plan (HCP) to support an application to the U.S. Fish and Wildlife Service (USFWS) for permits under the federal endangered species act for 25 years.

If this scenario is not familiar, please skip and proceed to the next Scenario.

1) Based on a typical project in your region or one that you have worked on, what are two wildlife species that could require an incidental take permit (ITP) for wind energy activities?

a. Species #1: _____
b. Species #2: _____

For this example, there have been no field studies at the site, but it is assumed that Species #1 is known to occur and has approximately 5,000 acres of potential habitat in the study area. For Species #2, there are records of species in the region but the potential usage or occupancy of Species #2 in the project site and study area is low.

Desktop and species field surveys: This includes all the activities and surveys to collect and assess the data to comply with required or standard species-specific field surveys in order to quantify or characterize "take" for the ITP/HCP.

1) What would be the estimated minimum cost that would be budgeted to complete the Desktop and Species Field Surveys? _____

2) What would be the estimated maximum cost that would be budgeted to complete the Desktop and Species Field Surveys? _____

3) Assuming, there was a notice to proceed, and fieldwork could start on January 1, what is the minimum number of months it would take to complete the Desktop and Species Field Surveys? _____

4) Assuming, there was a notice to proceed, and fieldwork could start on January 1, what is the maximum number of months it would take to complete the Desktop and Species Field Surveys? _____

Preparing, writing, and submitting the ITP/HCP: This includes all the costs of the consultant hired to support the energy company to get to the point where ITP/HCP is issued to the applicant. This would include the costs associated with the consultant supporting USFWS coordination/consultation.

1) What would be the estimated minimum cost that would be budgeted to complete the preparing, writing, and submitting of the ITP/HCP by an environmental consultant?

_____

2) What would be the estimated maximum cost that would be budgeted to complete the preparing, writing, and submitting of the ITP/HCP by an environmental consultant?

_____

3) For Environmental Consultants: Estimate the percentage of the total cost that directly relates to supporting and participating in coordination/consultation with USFWS?

_____

4) What is the minimum number of months it would take to complete preparing, writing, and submitting the ITP/HCP? _____

5) What is the maximum number of months it would take to complete preparing, writing, and submitting the ITP/HCP? _____

6) For Energy Companies: What is the estimated minimum full-time equivalent (FTE) that your organization would expect to spend managing and supporting the preparing, writing, and submitting of the ITP/HCP. For example, if a company had two people involved with the ITP/HCP and one person spent 20% of their time and other spent 10% of their time, the FTE would be 0.3? _____

Preparing, writing and submitting NEPA documents: This includes all the costs of the consultant hired to develop and finalize the NEPA analysis and documents for the ITP/HCP. It includes scoping, analyzing, writing, coordinating with USFWS, and getting and reviewing public comments.

1) What would be the estimated minimum cost that would be budgeted to complete the preparing, writing, and submitting of the NEPA documents by an environmental consultant? _____

2) What would be the estimated maximum cost that would be budgeted to complete the preparing, writing, and submitting of the NEPA documents by an environmental consultant? _____

3) What is the minimum number of months it would take to complete preparing, writing, and submitting the NEPA documents? _____

4) What is the maximum number of months it would take to complete preparing, writing, and submitting the NEPA documents? _____

Outside Legal services: Some organizations engage with outside counsel to help support the HCP process which may include engage with USFWS, interpreting and defining take, reviewing and writing sections of the HCP, and supporting obtaining necessary agreements and assurances of the ITP/HCP.

1) Would your organization engage with outside legal services for this type of HCP?
    a. Yes
    b. Maybe
    c. No

2) If yes or maybe: What would be the estimated minimum cost that would be budgeted for outside legal services? _____

3) If yes or maybe: What would be the estimated maximum cost that would be budgeted outside legal services? _____

Other Costs:

1) Are there other large/significant pre-implementation costs that have not been included in the questions above? Yes/No

2) If Yes, what are those type of costs?

3) If Yes, what would total cost range for them?

Scenario 3- Programmatic Wind Projects

An energy company is proposing a large Wind Energy Portfolio with 20 wind projects spread across one state. The applicant proposed to develop and operate these wind projects with a total of 2,000-operating 2.2 MW wind turbines and a net generating capacity of 4,400 megawatts (MW). The wind projects will be constructed over a total of 500,000 acres of land that is a combination of agriculture and natural habitats. Covered activities involve the construction, operation, maintenance, and eventual decommissioning of the wind energy facility. It does not include activities associated with building or maintaining transmission for the project. The company knows it will need to a Habitat Conservation Plan (HCP) to support an application to the U.S. Fish and Wildlife Service (USFWS) for permits under the federal endangered species act for 30 years. The entire proposal will affect multiple listed species and the Bald Eagle.

If this scenario is not familiar, please skip and proceed to the next Scenario.

1) Based on a typical project in your region or one that you have worked on, what are two wildlife species that could require an incidental take permit (ITP) for the wind projects activities?

a. Species #1: _____

b. Species #2: _____

For this example, there have been no field studies at the site, but it is assumed that Species #1 has approximately 150,000 acres of potential habitat in the study area and Species #2 has 100,000 acres of potential habitat in the study area. For Bald Eagles, there are records of species in the region but the potential usage or occupancy of Bald Eagles in the project site and study area is low and likely can be avoided.

Desktop and species field surveys: This includes all the activities and surveys to collect and assess the data to comply with required or standard species-specific field surveys in order to quantify or characterize "take" for the ITP/HCP.

1) What would be the estimated minimum cost that would be budgeted to complete the Desktop and Species Field Surveys? _____

2) What would be the estimated maximum cost that would be budgeted to complete the Desktop and Species Field Surveys? _____

3) Assuming, there was a notice to proceed, and fieldwork could start on January 1, what is the minimum number of months it would take to complete the Desktop and Species Field Surveys? _____

4) Assuming, there was a notice to proceed, and fieldwork could start on January 1, what is the maximum number of months it would take to complete the Desktop and Species Field Surveys? _____

Preparing, writing, and submitting the ITP/HCP: This includes all the costs of the consultant hired to support the energy company to get to the point where ITP/HCP is issued to the applicant. This would include the costs associated with the consultant supporting USFWS coordination/consultation.

1) What would be the estimated minimum cost that would be budgeted to complete the preparing, writing, and submitting of the ITP/HCP by an environmental consultant?

_____

2) What would be the estimated maximum cost that would be budgeted to complete the preparing, writing, and submitting of the ITP/HCP by an environmental consultant?

_____

3) For Environmental Consultants: Estimate the percentage of the total cost that directly relates to supporting and participating in coordination/consultation with USFWS?

_____

4) What is the minimum number of months it would take to complete preparing, writing, and submitting the ITP/HCP? _____

5) What is the maximum number of months it would take to complete preparing, writing, and submitting the ITP/HCP? _____

6) For Energy Companies: What is the estimated minimum full-time equivalents (FTE) that your organization would expect to spend managing and supporting the preparing, writing, and submitting of the ITP/HCP. For example, if a company had two people involved with the ITP/HCP and one person spent 20% of their time and other spent 10% of their time, the FTE would be 0.3? _____

Preparing, writing and submitting NEPA documents: This includes all the costs of the consultant hired to develop and finalize the NEPA analysis and documents for the ITP/HCP. It includes scoping, analyzing, writing, coordinating with USFWS, and getting and reviewing public comments.

1) What would be the estimated minimum cost that would be budgeted to complete the preparing, writing, and submitting of the NEPA documents by an environmental consultant? _____

2) What would be the estimated maximum cost that would be budgeted to complete the preparing, writing, and submitting of the NEPA documents by an environmental consultant? _____

3) What is the minimum number of months it would take to complete preparing, writing, and submitting the NEPA documents? _____

4) What is the maximum number of months it would take to complete preparing, writing, and submitting the NEPA documents? _____

Outside Legal services: Some organizations engage with outside counsel to help support the HCP process which may include engage with USFWS, interpreting and defining take, reviewing and writing sections of the HCP, and supporting obtaining necessary agreements and assurances of the ITP/HCP.

1) Would your organization engage with outside legal services for this type of HCP?

   a. Yes

   b. Maybe

   c. No

2) If yes or maybe: What would be the estimated minimum cost that would be budgeted for outside legal services? _____

3) If yes or maybe: What would be the estimated maximum cost that would be budgeted outside legal services? _____

Other Costs:

1) Does the addition of the Bald Eagle significantly impact pre-implementation activities and costs? Yes/No

   a. Please expand:

2) Are there other large/significant pre-implementation costs that have not been included in the questions above? Yes/No

3) If Yes, what are those type of costs?

4) If Yes, what would total cost range for them?

Scenario 4- Transmission system

An energy company is proposing an electric and natural gas transmission and distribution lines. The applicant proposed to develop and operate an electric transmission system, which encompasses 150 miles and 1,900 acres of Right of Way (ROWs). Covered activities involve the reconstruction and new construction activities associated with electric transmission, sub-transmission and distribution facilities, and natural gas pipeline facilities. It does not include activities completed by other entities in the same areas. The company knows it will need to a Habitat Conservation Plan (HCP) to support an application to the U.S. Fish and Wildlife Service (USFWS) for permits under the federal endangered species act for 50 years.

If this scenario is not familiar, please skip and proceed to the next Scenario.

1) Based on a typical project in your region or one that you have worked on, what are two wildlife species that could require an incidental take permit (ITP) for the transmission line activities?

a. Species #1: _____

b. Species #2: _____

For this example, there have been no field studies at the site, but it is assumed that Species #1 has approximately 1,000 acres of potential habitat in the study area. For Species #2, there are records of species in the region but the potential usage or occupancy of Species #2 in the project site and study area is low and likely can be avoided.

Desktop and species field surveys: This includes all the activities and surveys to collect and assess the data to comply with required or standard species-specific field surveys in order to quantify or characterize "take" for the ITP/HCP.

1) What would be the estimated minimum cost that would be budgeted to complete the Desktop and Species Field Surveys? _____

2) What would be the estimated maximum cost that would be budgeted to complete the Desktop and Species Field Surveys? _____

3) Assuming, there was a notice to proceed, and fieldwork could start on January 1, what is the minimum number of months it would take to complete the Desktop and Species Field Surveys? _____

4) Assuming, there was a notice to proceed, and fieldwork could start on January 1, what is the maximum number of months it would take to complete the Desktop and Species Field Surveys? _____

Preparing, writing, and submitting the ITP/HCP: This includes all the costs of the consultant hired to support the energy company to get to the point where ITP/HCP is issued to the applicant. This would include the costs associated with the consultant supporting USFWS coordination/consultation.

1) What would be the estimated minimum cost that would be budgeted to complete the preparing, writing, and submitting of the ITP/HCP by an environmental consultant?

_____

2) What would be the estimated maximum cost that would be budgeted to complete the preparing, writing, and submitting of the ITP/HCP by an environmental consultant?

_____

3) For Environmental Consultants: Estimate the percentage of the total cost that directly relates to supporting and participating in coordination/consultation with USFWS?

_____

4) What is the minimum number of months it would take to complete preparing, writing, and submitting the ITP/HCP? _____

5) What is the maximum number of months it would take to complete preparing, writing, and submitting the ITP/HCP? _____

6) For Energy Companies: What is the estimated minimum full-time equivalents (FTE) that your organization would expect to spend managing and supporting the preparing, writing, and submitting of the ITP/HCP. For example, if a company had two people involved with the ITP/HCP and one person spent 20% of their time and other spent 10% of their time, the FTE would be 0.3? _____

Preparing, writing and submitting NEPA documents: This includes all the costs of the consultant hired to develop and finalize the NEPA analysis and documents for the ITP/HCP. It includes scoping, analyzing, writing, coordinating with USFWS, and getting and reviewing public comments.

1) What would be the estimated minimum cost that would be budgeted to complete the preparing, writing, and submitting of the NEPA documents by an environmental consultant? _____

2) What would be the estimated maximum cost that would be budgeted to complete the preparing, writing, and submitting of the NEPA documents by an environmental consultant? _____

3) What is the minimum number of months it would take to complete preparing, writing, and submitting the NEPA documents? _____

4) What is the maximum number of months it would take to complete preparing, writing, and submitting the NEPA documents? _____

Outside Legal services: Some organizations engage with outside counsel to help support the HCP process which may include engage with USFWS, interpreting and defining take, reviewing and writing sections of the HCP, and supporting obtaining necessary agreements and assurances of the ITP/HCP.

1) Would your organization engage with outside legal services for this type of HCP?
    a. Yes
    b. Maybe
    c. No
2) If yes or maybe: What would be the estimated minimum cost that would be budgeted for outside legal services? _____
3) If yes or maybe: What would be the estimated maximum cost that would be budgeted outside legal services? _____

Other Costs:

1) Are there other large/significant pre-implementation costs that have not been included in the questions above? Yes/No
2) If Yes, what are those type of costs?
3) If Yes, what would total cost range for them?

Scenario 5- Operation and maintenance of transmission line example for multiple species.

An energy company is proposing an electric and natural gas transmission and distribution lines. The applicant proposed to develop and operate an electric transmission system, which encompasses a total area of 400,000 acres. This land includes mostly urban land-cover, followed by natural land-cover, and finally, agricultural land-cover. Covered activities involve the reconstruction and new construction activities associated with electric transmission, sub-transmission and distribution facilities, and natural gas pipeline facilities. The company knows it will need to a Habitat Conservation Plan (HCP) to support an application to the U.S. Fish and Wildlife Service (USFWS) for permits under the federal endangered species act for 30 years. This project will impact multiple species.

If this scenario is not familiar, please skip and proceed to the final feedback questions.

1) Based on a typical project in your region or one that you have worked on, what are two wildlife species that could require an incidental take permit (ITP) for the transmission line activities?

a. Species #1: _____
b. Species #2: _____
c. Species #3: _____
d. Species #4: _____
e. Species #5: _____

For this example, there have been no field studies at the site, but it is assumed that Species #1 has approximately 200,000 acres of potential habitat in the study area and Species #2 has 100,000 acres. For Species #3, 4, & 5, there are records of those species in the region but the potential usage or occupancy in the project site and study area is low and likely can be avoided.

Desktop and species field surveys: This includes all the activities and surveys to collect and assess the data to comply with required or standard species-specific field surveys in order to quantify or characterize “take” for the ITP/HCP.

1) What would be the estimated minimum cost that would be budgeted to complete the Desktop and Species Field Surveys? _____

2) What would be the estimated maximum cost that would be budgeted to complete the Desktop and Species Field Surveys? _____

3) Assuming, there was a notice to proceed, and fieldwork could start on January 1, what is the minimum number of months it would take to complete the Desktop and Species Field Surveys? _____

4) Assuming, there was a notice to proceed, and fieldwork could start on January 1, what is the maximum number of months it would take to complete the Desktop and Species Field Surveys? _____

Preparing, writing, and submitting the ITP/HCP: This includes all the costs of the consultant hired to support the energy company to get to the point where ITP/HCP is issued to the applicant. This would include the costs associated with the consultant supporting USFWS coordination/consultation.

1) What would be the estimated minimum cost that would be budgeted to complete the preparing, writing, and submitting of the ITP/HCP by an environmental consultant?

_____

2) What would be the estimated maximum cost that would be budgeted to complete the preparing, writing, and submitting of the ITP/HCP by an environmental consultant?

_____

3) For Environmental Consultants: Estimate the percentage of the total cost that directly relates to supporting and participating in coordination/consultation with USFWS?

_____

4) What is the minimum number of months it would take to complete preparing, writing, and submitting the ITP/HCP? _____

5) What is the maximum number of months it would take to complete preparing, writing, and submitting the ITP/HCP? _____

6) For Energy Companies: What is the estimated minimum full-time equivalents (FTE) that your organization would expect to spend managing and supporting the preparing, writing, and submitting of the ITP/HCP. For example, if a company had two people involved with the ITP/HCP and one person spent 20% of their time and other spent 10% of their time, the FTE would be 0.3? _____

Preparing, writing and submitting NEPA documents: This includes all the costs of the consultant hired to develop and finalize the NEPA analysis and documents for the ITP/HCP. It includes scoping, analyzing, writing, coordinating with USFWS, and getting and reviewing public comments.

1) What would be the estimated minimum cost that would be budgeted to complete the preparing, writing, and submitting of the NEPA documents by an environmental consultant? _____

2) What would be the estimated maximum cost that would be budgeted to complete the preparing, writing, and submitting of the NEPA documents by an environmental consultant? _____

3) What is the minimum number of months it would take to complete preparing, writing, and submitting the NEPA documents? _____

4) What is the maximum number of months it would take to complete preparing, writing, and submitting the NEPA documents? _____

Outside Legal services: Some organizations engage with outside counsel to help support the HCP process which may include engage with USFWS, interpreting and defining take, reviewing and writing sections of the HCP, and supporting obtaining necessary agreements and assurances of the ITP/HCP.

1) Would your organization engage with outside legal services for this type of HCP?

    a. Yes

    b. Maybe

    c. No

2) If yes or maybe: What would be the estimated minimum cost that would be budgeted for outside legal services? _____

3) If yes or maybe: What would be the estimated maximum cost that would be budgeted outside legal services? _____

Other Costs:

1) Are there other large/significant pre-implementation costs that have not been included in the questions above? Yes/No

2) If Yes, what are those type of costs?

3) If Yes, what would total cost range for them?

<u>Feedback Questions:</u>

1. What are other ways to capture pre-implementation costs for HCPs?

_____
_____
_____
_____

2. For future surveys, what should EPRI focus on? Specific questions or scenarios?

_____
_____
_____
_____

3. Any additional feedback:

_____
_____
_____
_____

4. Would you be willing to be contacted by EPRI for further development on this survey? (Y/N)