

THE HISTORIC AND PRESENT USE OF HABITAT CONSERVATION PLANS FOR THE
PROTECTION OF AQUATIC SPECIES

by

CATHERINE SUSAN BARTENSTEIN

(Under the Direction of Laurie Fowler)

ABSTRACT

Habitat conservation plans have been used since 1982 when Section 10 was added to the Endangered Species Act, but were not heavily utilized until the Clinton administration amended the section to give assurances to land owners regarding their future obligations under the plans. Despite the increase in popularity, very little has been written about their application to listed aquatic species. In order to contribute to this limited literature, I have compiled a comprehensive analysis of techniques used and characteristics commonly associated with aquatic plans. Additionally, I implemented a case study format for a limited number of plans in order to examine the social and political context under which they were established. Together, these chapters can be used to better understand the development of aquatic plans and to provide categorical information for the analysis of plan success for the benefit of landowners and government agencies responsible for developing effective solutions to imperiled species management.

INDEX WORDS: Endangered Species Act, habitat conservation plan, aquatic, Section 10, endangered species, threatened species, development

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CATHERINE SUSAN BARTENSTEIN

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CATHERINE SUSAN BARTENSTEIN

Major Professor: Laurie Fowler

Committee: Robin McDowell
Mary Freeman

Electronic Version Approved:

Julie Coffield
Interim Dean of the Graduate School
The University of Georgia
August 2014

DEDICATION

I would like to dedicate this thesis to my parents. To my mother, for being one of the most intelligent, independent, and admirable women I have ever met and instilling in me a love of nature at a young age. And to my father, for raising me to whole-heartedly believe that I could do anything I put my mind to and for encouraging me every step of the way. Without them to guide and inspire me, I would not be the person I am today.

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LIST OF ACRONYMS

Ac-ft, Ac-ft/yr: Acre-feet and acre-feet per year
AFCS: Anadromous Fish Conservation Strategy
AMF: Aquifer management fee
AMP : Adaptive Management Plan
ASR: Aquifer storage and recovery
CEQA: California Environmental Quality Act
COI: Certificate of Inclusion
Csf: cubic square feet
DOI: Department of Interior
EA: Environmental Assessment
EAA: Edwards Aquifer Act
EAHCP: Edwards Aquifer Habitat Conservation Plan
EARIP: Edwards Aquifer Recovery Implementation Program
EIS: Environmental Impact Statement
ESA: Endangered Species Act
HCP: Habitat Conservation Plan
IA: Implementation Agreement
IFS: Instream Flow Strategy
ITP: Incidental Take Permit
MOU: Memorandum of Understanding
MRC: Mendocino Redwood Company
NEPA: National Environmental Protection Act
NOAA: Nation Oceanic and Atmospheric Administration
SAC: Science advisory committee
SAWS: San Antonio Water System
SSC: Science subcommittee
The Services: USFWS and NOAA
TNC: The Nature Conservancy
TPWD: Texas Parks and Wildlife Department
TSU: Texas State University
TWRA: Tennessee Wildlife Resources Agency
USFWS: United States Fish and Wildlife Service
UT: University of Tennessee
VISPO: Voluntary Irrigation Suspension Option
WDFW: Washington Department of Fish and Wildlife
WDOE: Washington State Department of Ecology

DEFINITION OF TERMS

- **Covered activities:** Activities likely to result in incidental take that are reasonably certain to occur over the life of the permit and that the permit holder has direct control over. These can include, but are not limited to, development, resource use, operations and maintenance, habitat management and restoration, and monitoring.
- **California Environmental Quality Act:** A state law applied to all discretionary projects proposed to be conducted or approved by a California public agency, including private projects requiring discretionary government approval.
- **Adaptive management:** A decision process that promotes flexible decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. Monitoring of these outcomes both advances scientific understanding and helps adjust policies or operations as part of an iterative learning process. Adaptive management also recognizes the importance of natural variability in contributing to ecological resilience and productivity. It is not a ‘trial and error’ process, but rather emphasizes learning while doing. Adaptive management does not represent an end in itself, but rather a means to more effective decisions and enhanced benefits. Its true measure is in how well it helps meet environmental, social, and economic goals, increases scientific knowledge, and reduces tensions among stakeholders. (DOI Adaptive Management Technical Guide)
- **Harass:** An intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly impair normal behavioral patterns including breeding, feeding, or sheltering. (50 CFR 17.3)
- **Harm:** Significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavior patterns, including breeding, feeding, or sheltering. (50 CFR 17.3)
- **Incidental Take Permit:** A permit issued under Section 10 of the Federal Endangered Species Act to private parties undertaking otherwise lawful projects that might result in the take of an endangered or threatened species. Application for an incidental take permit is subject to certain requirements, including preparation by the permit applicant of a conservation plan, generally known as a "Habitat Conservation Plan" or "HCP." (USFWS)
- **Permit area:** Geographic area where the incidental take permit applies.
- **Planning area** (plan area, study area): Geographic area that will include all covered activities, all incidental take authorized, and all conservation actions
- **Significant:** Significance requires consideration of context and intensity. The significance of an action must be analyzed in several contexts such as society as a whole, the affected region, the affected interests, and the locality. Significance varies with the setting of the proposed action. (40 CFR 1508.27)
- **Take:** To harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect an endangered species, or to attempt to engage in any such conduct.
- **Natural Community Conservation Planning:** A program found in the state of California designed to take a broad-based ecosystem approach to planning for the protection and perpetuation of biological diversity. An NCCP identifies and provides for

the regional or area-wide protection of plants, animals, and their habitats, while allowing compatible and appropriate economic activity.

CHAPTER 1

THE ENDANGERED SPECIES ACT

Introduction

“Species once lost do not reappear” – Charles Darwin (1895)

The Endangered Species Act (ESA) is frequently cited as the most powerful environmental law in the U.S. (Czech & Krausman, 2001; Harris et al., 2012; Waples & Taylor, 2007). Designed to halt and reverse the trend of species extinction, its influence reaches across all 50 states and their waterways, protecting a total of 1344 animal species and their habitats ("Summary of Listed Species, Listed Populations, and Recovery Plans," 2013). Despite this wide application, critics representing diverse interest groups assert that the statute is failing to achieve its lofty goals (Czech & Krausman, 2001). It is crucial that we understand the issues contributing to this perceived failure and the tools at our disposal to resolve these issues if we hope to take meaningful action to ensure the continued survival of imperiled species, especially in a time of rapidly increasing development and human population growth. Darwin's statement is a constant reminder of why this work is so important.

Section 10 of the ESA was added in 1982 in order to add flexibility to an otherwise stringent statute. Section 10 allows non-federal entities the ability to apply and receive an incidental take permit (ITP) through the creation of a habitat conservation plan (HCP). The goal of this thesis is to analyze trends found within aquatic HCPs in order to provide guidance for plan development to future ITP applicants and the federal agencies charged with the protection of listed species. Further attention will be given to a case study of the regional Etowah Aquatic

Habitat Conservation Plan, a multi-jurisdictional HCP which was developed in the 2000s to protect three endangered fishes of the Etowah River Basin in northeast Georgia. My research methods included a literature review of scholarly articles related to HCPs and aquatic habitat conservation, statutory and regulatory analysis, a close reading and analysis of 36 aquatic HCPs, personal communications with individuals involved with the HCPs, and a review of grey literature related to the development and public review of the Etowah HCP.

Methods

The study of the implementation of federal policy requires the application of multiple social science research methodologies in order to adequately examine its many facets. In my research, I used a combination of archival, historical, and case study methodologies in order to investigate the historical context of the ESA and its current application in aquatic habitat conservation plans. Due to the unique nature of every HCP, I faced challenges identifying the most appropriate HCPs for my study, generalizing results from these highly variable scenarios and drawing relevant conclusions of causal relationships. In order to address these difficulties, I attempted to maintain a standard approach in searching for literature, identifying the most relevant HCPs, and analyzing each HCP.

For Chapter 1, I conducted archival research¹ on the evolution of The Endangered Species Act and the strengths and weaknesses of Section 10 and habitat conservation plans. In order to select appropriate materials, I narrowed my information based on a series of search criteria. I used Google Scholar and the GALILEO database from UGA's library as my search engines. The terms "Endangered Species Act", "Endangered Species Act, Critique", "Endangered Species Act, aquatic", "Endangered Species Act, Habitat Conservation Plan", and

¹ Archival research is a qualitative method of research which involves describing data that existed before the time of the study (Jackson, 2012).

“Aquatic endangered species, habitat conservation” were my main search queries. I chose articles that appeared on the first two pages of results when sorted by relevance and which focused primarily on policy issues rather than biological ones. Although I read all of these articles and incorporated many into this thesis, the focus of the selection was on papers addressing Section 10 of the ESA and the implementation of HCPs. Sources which were cited by these papers were also included in my analysis when appropriate. I also conducted a close reading of the ESA, its amendments, and other governmental documents such as the USFWS’s Habitat Conservation Planning and Incidental Take Permit Processing Handbook (HCP Handbook) in order to provide substantial background information.

The goal of Chapter 2 is to provide a synthesis of aquatic HCPs, most of which have been implemented, and determine trends and common characteristics amongst them. The chapter includes an overview and case studies. Factors I analyzed across all of the plans in my study were species protected, number of applicants, associated NEPA documents, time taken to procure an incidental take permit (ITP),² covered activities, characteristics of management terms, and funding mechanisms; case studies include these elements in addition to detailed background, adaptive management measures, alternatives to the plans, and a discussion of its application to the analysis of the Etowah HCP. Plans were chosen for this study based on two factors: that they included at least one lake or stream aquatic species and that they contained conservation or mitigation measures designed specifically for the protection of those aquatic species.

To locate plans adhering to my criteria, I used the USFWS’s Environmental Conservation Online System (ECOS), a database of habitat conservation plans.³ ECOS lists HCPs by region

² An ITP is a permit issued by the USFWS or NOAA which allows the applicant to legally take a certain amount of endangered species habitat or number of individuals. See pg. 12 for definition of take.

³ Unfortunately, ECOS is not an entirely comprehensive database of HCPs. The understaffed and overworked field offices are charged with keeping the database current rather than having a system for automatic updates with the

and includes only the title of the HCP and the species covered along with the date of the ITP issuance and the geographic area covered by the HCP. There is no way to filter for aquatic plans, so I manually identified plans which contained my required species. I reviewed *Habitat Conservation Planning for Endangered Species* to locate HCPs still under development. The document was prepared by the USFWS as a supplement to a training course, open to its personnel and others involved in the preparation and review of HCPs, which I attended in summer 2013. The document referred to two appropriate in-progress plans. I found the remaining HCPs that are currently under development via word of mouth; it is likely that there are other aquatic HCPs which are still under development that are not included in my study.⁴ From my compilation of aquatic HCPs, I omitted seven from the review. In one case I was unable to find the HCP; it was a plan covering the small geographic area and rural activities of a single applicant on private land, making it relatively insignificant for my study. The rest were omitted because their management terms were directed towards terrestrial species with aquatic animals benefiting sheerly from land preservation or acquisition.

One of the elements of concern in my thesis is the Services' ability to process an HCP within their suggested timeframe.⁵ I used the Federal Register in order to establish a timeline from submission of the application for the ITP associated with each HCP to the issuance of the ITP. This timeline included dates for the Notice of Intent to produce an EIS (if an EIS was required), the availability of the draft National Environmental Policy Act (NEPA) document, the availability of the Final Environmental Impact Statement (EIS) (if an EIS was produced) and the

issuance of new ITPs. Due to this, there are likely aquatic plans which have been permitted but are not included in my analysis.

⁴ Since there is no database of HCPs which are currently in development, I had limited options in finding such plans.

⁵ The HCP Handbook outlines timeframes suggested for the processing of HCPs based on their associated required NEPA document, discussed in more detail below.

issue date of the ITP (found in both ECOS and the Federal Register).⁶ These dates were used to quantify the average time for processing an ITP. In the case of an HCP requiring only an Environmental Assessment (EA), there was no notice of intent to prepare a NEPA document, and thus, there was no discernable date for the original submission of the HCP application. In these cases, I relied on the websites of the HCPs if they were still active and contained the relevant documents or contacted the HCP administrator.

To extract common management practices, key stressors addressed by these practices, and funding mechanisms for plan implementation, I read each available HCP on my list. I used Google to search for the specific HCPs. This search typically led me to a website dedicated to the HCP or to a website of the lead applicant, mentioning the HCP. In all but three cases, these websites hosted a copy of the HCP. In the three cases where these could not be found through Google, I reviewed the EA or EIS document hosted on the USFWS website; I used these NEPA documents to determine the relevant characteristics of those HCPs. I was only able to locate a draft copy of the Malpai Borderlands HCP, so information relating to that plan may be imperfect. I read both the HCP and the associated NEPA document for each of the five case studies included in my study.

I used Google Scholar and the GALILEO database to research literature regarding funding mechanisms for HCPs and aquatic HCPs. As there is limited literature available specifically addressing funding mechanisms for such plans beyond the HCP Handbook (1996), I searched primarily for literature related to environmental economics and willingness to pay for ecosystem services as a proxy for HCP funding. Additionally, I considered the funding mechanisms of those plans used within my study.

⁶ For more details regarding the NEPA documentation and process, see pg. 21

In Chapter 3, I reviewed the development and subsequent history of the regional Etowah Aquatic Habitat Conservation Plan (Etowah HCP). Much of my information for this plan came from the Etowah HCP website, interviews with those involved in the development of the project, and grey literature outlining the events of the project's development. The documents hosted on the website included, but were not limited to, the HCP itself, the EA, Fact Sheets about the Etowah species, Costs of the HCP, Overview of Policies and Update of HCP and four Etowah Aquatic Annual Reports. Although not peer-reviewed, these documents provide unaltered evidence of the opinions and actions of the Etowah Aquatic HCP committees at the time of development. Additionally, I interviewed staff at the field office of the USFWS involved with the creation of the plan.

The Endangered Species Act

The ESA was passed by Congress in 1973 during a time marked by unusually high environmental activism. The publication of Rachel Carson's Silent Spring, the Cuyahoga River catching fire with subsequent phenomenal media coverage, and the dangerous smog blanketing large cities from Las Angeles to New York all contributed to a social movement in favor of restoring and protecting our natural resources (Czech & Krausman, 2001, p. 21). The strong pro-environmental mood led to the passage of federal environmental laws such as the Clean Air Act and the Clean Water Act, and culminated in the passage of the ESA, considered the strongest and most influential of any environmental statute (Harris et al., 2012; Rohlf, 2005). The goals of the ESA are to "provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, to provide a program for the conservation of such endangered and threatened species, and to take such steps as may be appropriate to achieve the purposes of the treaties and conventions set forth in subsection (a) of this section" (16 U.S.C

1531(b)). Congress's clear intent in enacting the statute was to "halt and reverse the trend toward species extinction, whatever the cost" which has been repeatedly upheld by the courts ("Animal Welfare Institute v. Beech Ridge Energy, LLC. ," December 8, 2009; "The Aransas Project v. Shaw," March 11, 2013; "Tennessee Valley Authority v. Hill ", 1978).

As originally enacted, the statute consisted of three major components: the provisions for listing species as threatened or endangered (Section 4), the requirement for consultation with the FWS by federal agencies seeking approval for projects affecting listed species (Section 7), and the prohibition against "take"⁷ of a listed species by private landowners (Section 9) (Moser, 2000). Section 9 created tension between landowners and those charged with and advocating for the protection of listed species. The resulting conflict created perverse incentives for landowners to modify or destroy potential habitat, withhold information from government agencies, or cause direct mortality to species on their land that were listed or at risk of being listed in order to avoid the strict regulations (Czech & Krausman, 2001; Langpap & Kerkvliet, 2012). To ease tensions and add flexibility, Congress amended the ESA in 1982 (16 U.S.C. § 1539) to include Section 10. Section 10 allows landowners to apply for incidental take permits (ITPs) which grant them the legal right to kill a certain number of animals or destroy a certain amount of habitat⁸ if they have completed an HCP which has been approved by the Services and demonstrates that its implementation will not appreciably reduce the likelihood of survival and recovery of the species. This section was added as an escape valve for landowners who wanted to develop or alter their property where a listed species was present.

The ESA vests jurisdictional authority to two federal agencies, the US Fish and Wildlife Service and the National Oceanic Atmospheric Administration (the Services). The USFWS is

⁷ For definition of take, see pg. 12.

⁸ In order to receive an ITP, the take must be the result of an otherwise lawful activity.

responsible for terrestrial and freshwater aquatic species while NOAA is responsible for marine and anadromous species. The Services are authorized to list species, establish critical habitat and develop recovery plans for listed species, issue and regulate ITPs, and ensure jeopardy is not occurring for listed species (Ando, 1999; Nazzaro, 2008).

Section 3 of the ESA defines key terms used throughout the Act; the following are included as they are crucial for a complete understanding of the implications and context of the ESA as related to HCPs. Endangered species are defined as “any species which is in danger of extinction throughout all or a significant portion of its range...” (16 U.S.C. § 1532). A threatened species is “any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range” (*id*). A species itself is “any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature” (*id*). ‘Critical habitat,’ is defined as “the specific areas within the geographical area occupied by the species, at the time it is listed ... on which are found those physical or biological features (i) essential to the conservation of the species and (ii) which may require special management considerations or protection” (*id*).

Section 4 of the ESA covers the listing of species and designation of their critical habitats. This process is arguably the most significant action to be taken, as species are offered no protection until they have been officially listed (Ando, 1999). The Services can nominate species for listing, but most are petitioned by the public for listing (Brosi & Biber, 2012). Regardless of who nominates the species, listing decisions are made by the Secretaries of Commerce and Interior or by an alternative appointed by the Secretaries. Those decisions are to be made “solely on the basis of the best scientific and commercial data available” (16 U.S.C. § 1533(b)(1)(a)). While the ‘best scientific data’ may not always be easily determined, the wording

is meant to prevent the agency from making listing decisions based on economic or arbitrary considerations. In determining the qualifications of a species for listing the Secretary must consider (i) the present or threatened destruction, modification, or curtailment of its habitat or range, (ii) overutilization for commercial, recreational, scientific, or educational purposes, (iii) the inadequacy of existing regulatory mechanisms, or (iv) other natural or manmade factors affecting its continued existence (16 U.S.C. § 1533 (a)(1)(A-E)).

The Services are required to adhere to a strict regulatory procedure when deciding on a listing. They must decide if a petition is “substantial” or “not substantial” within 90 days of receipt; if the species is found to be substantial, then they must make a finding of “warranted” or “not warranted” within 12 months.⁹ If a species is found to be warranted for listing, the Services have an additional year to complete a final rule for the species or withdraw the species from the process (16 U.S.C. § 1533 (b)(3)(A-B); 16 U.S.C. § 1533 (b)(6)(A)). The Services are frequently unable to make determinations within this timeframe due to inadequate staff and unmanageable numbers of petitions (Brosi & Biber, 2012). Regardless of the cause, failure to meet these deadlines frequently results in costly lawsuits against the Services and court-imposed timelines to complete determinations.¹⁰

Both governmental agencies and private property owners are required to adhere to ESA standards, although there is a unique trajectory that must be followed by each. Federal and state agencies are incorporated under Sections 6 and 7 of the ESA (U.S.C. 1535; U.S.C 1536). Section 6 sets out the guidelines for cooperation with states, stating that the Secretary shall cooperate to the ‘maximum extent practicable’ with the states. This cooperation includes consultation with the states concerned before acquiring any land or water for the purpose of conserving an

⁹ There is a third option of “warranted but precluded” which moves the species to “candidate” status and out of a legally binding time frame.

¹⁰ See Chapter 2 for more details discussing lawsuits and ESA.

endangered or threatened species as a sign of political courtesy. This section also allows for states to more easily create their own HCPs for approval by the USFWS by granting state governments access to the Habitat Conservation Planning Assistance and Land Acquisition Grants.

Section 7 of the ESA outlines the requirements for interagency cooperation and mandates that all federal agencies “utilize their authorities in furtherance of the purposes of [the ESA] by carrying out programs for the conservation of endangered and threatened species” (16 U.S.C. § 1536(a)(1)). Every federal agency must “ensure that any action authorized, funded, or carried out by such agency...is not likely to jeopardize the continued existence” of a listed species (threatened or endangered) or the modification or destruction of critical habitat (U.S.C. §1536(a)(2)). The power of this section can be seen in *Tennessee Valley Authority v. Hill*, a case which resulted in the halting of a multimillion dollar federal dam project which was near completion. The court required TVA to cease the construction of the dam, saying, “One would be hard pressed to find a statutory provision whose terms were any plainer than those in 7 of the Endangered Species Act...This language admits of no exception” (“*Tennessee Valley Authority v. Hill*”, 1978)

Section 9 (16 U.S.C. 1538) applies to all non-federal entities and prohibits the ‘taking’ of endangered or threatened species, the modification or destruction of critical habitat and the importing or exporting of a listed species by private individuals. ‘Take’, as defined in Section 3, means to ‘harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such activity’ (16 U.S.C. 1532) while ‘harm’ includes any modification or destruction of a species designated critical habitat (50 C.F.R § 17.3). The National Marine Fisheries Service goes on to clarify that habitat modification is considered ‘harm’ when “it

actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding or sheltering” (64 Fed. Reg. 60,727 (November 9,1999)). This broad interpretation has been upheld by the Supreme Court in *Babbitt v. Sweet Home Chapter of Communities for a Great Oregon* (515 U.S. 687, 708 (1995)) in 1995.

The tension caused by Section 9 between perceived property rights and conservation is further fueled in the case of aquatic species due to the intimate connection between land use and water quality. Conservation of imperiled aquatic species can result in disruption in dam construction (437 U.S. 153), water withdrawals (601 F. 3d 1096, 2010), and irrigation measures (Moore, Mulville, & Weinberg, 1996) in addition to development, forestry, agricultural and ranching land activities (Doremus, 2001). The extensive activities and users which can affect aquatic species make enforcement of Section 9 difficult in many situations. If a single user commits a blatant act of ‘taking’ such as dumping waste into critical habitat of a listed species, the situation can be more easily resolved. However, it is likely that the ‘taking’ of an aquatic species will be a cumulative effect of many individuals exercising their legal rights, from the construction of development projects on land adjacent to a body of water to the legal fulfillment of water rights. Regardless of the responsible entity(s), a ‘causal link’ must be established between the activity and harm before any action can be taken. The Service’s authorization to halt a number of private activities and the perceived placement of unfair burdens on private land owners led to the addition of Section 10 of the ESA in 1982.

Section 10 was meant to act as an escape valve to the rigid Section 9 for landowners with listed species on their property through the implementation of a conservation plan that ensures the avoidance, minimization, and mitigation of any ‘take’ incidental to activities taking place during the project. This option was not heavily utilized within the first ten years, prompting the

Clinton administration to implement the “No Surprises” clause, which assured participants that they would not be required to fulfill obligations beyond those agreed upon at the time of issuance of the ITP. With “No Surprises” in place, utilization of ITPs increased significantly with 225 plans approved between 1994 and 1997. HCPs have continued to grow in popularity with “over six hundred and seventy five HCPs and nearly eight hundred ITPs¹¹ covering over 40 million acres and hundreds of species” by 2012 (Langpap & Kerkvliet, 2012, p. 2). While Section 10 has been embraced by the Services and by some stakeholders, some scientists and environmental activists question Section 10’s ability to adequately protect species from extinction. Conversely, some developers and other members of the community disparage HCPs as time-consuming, over-reaching and expensive. Far from pacifying critics of the ESA, HCPs have simply changed the dialogue surrounding ESA implementation on private lands (Doremus, 1997, p. 711).

Habitat Conservation Plans

The goal of Section 10 is to offer protection of a species as a whole without halting all development in a habitat area. Section 10(a)(1)(B) allows for the Secretary of the Interior to issue incidental take permits (ITPs) to non-federal entities whose otherwise legal projects may result in the take of an endangered, threatened or at risk species. Before the Secretary can issue a permit, the applicant must develop and have approved a habitat conservation plan which illustrates how (i) ‘take’ of the species is unavoidable, (ii) the applicant has minimized the ‘take’ of the species to the maximum extent practicable, and (iii) the ‘take’ that has occurred will be mitigated. If these conditions are met, an ITP will be issued and the project may proceed (*Habitat Conservation Planning Handbook*, 1996). Additionally, the plan must clearly specify the likely impact of the plan, or the exact ‘take’ expected of each species; reliable funding sources must be

¹¹ The discrepancy between number of ITPs issued and HCPs implemented is due to the fact that multiple ITPs can be distributed for a single HCP.

identified and funding obligations delineated; alternatives to the proposed plan must be listed with an explanation of why they were not chosen; and adaptive management measures in response to unforeseen circumstances must be included. Collectively, the plan must demonstrate that its implementation will not appreciably reduce the likelihood of the survival and recovery of the species in the wild (50 C.F.R. § 17.2(b)(1)(iii)(D)).

When utilized to their fullest potential, HCPs further the goals of the ESA in many ways. The flexibility of HCPs promotes negotiations rather than litigation. HCPs offer the Services the ability to coordinate habitat reserves.¹² They promote the generation of knowledge about listed species, requiring studies and analyses to take place before ITPs are issued. They offer opportunities for the public to become more aware of listed species in their area through public outreach (included in many Regional HCPs)¹³ or through the public comment periods required by NEPA. They ensure funds will be available for species protection throughout the permit duration.¹⁴ Finally, HCPs provide structure to conservation efforts, giving applicants flexible guidelines for achieving goals throughout the lifetime of the permit. Unfortunately, however, the HCP development process is rarely a smooth one and the resulting HCP might not ultimately achieve all of the above benefits.

The development of HCPs is a highly politicized and polarized issue, with everything from adaptive management measures (Wilhere, 2002) to public participation (Hood, 1998) subject to criticism. This is unsurprising, however, given the highly diverse group of stakeholders involved in the planning. Land developers, city and county utilities, commercial

¹² Coordination of reserves could be used in order to create a comprehensive network of complimentary habitats or to ensure the protection of larger swaths of habitat.

¹³ For more information regarding Regional HCPs, see pg. 17

¹⁴ Both flora and fauna can be covered within an HCP and, once included, they are granted the same protection. Although there are HCPs within my study that include aquatic flora species, management practices designed specifically for flora species are not addressed in Chapter 2.

foresters, conservationists, the Services and environmentalists are just some of the interests that are represented during the development of HCPs. While the Services laud HCPs as having achieved the fine balance between these competing interests, many in the scientific and environmental communities remain skeptical (Kareiva et al., 1999; Rahn, Doremus, & Diffendorfer, 2006; Shilling, 1997; Watchman, Groom, & Perrine, 2001). Although the only economic consideration that should be measured by the Services is the practicability for an applicant to ensure that resources will be available to implement the plan, that is rarely the case and short-term economic interests have been found to outweigh conservation measures in some cases. A situation in which this occurred was the production of an HCP for the Northern Spotted Owl; arbitrary management and conservation measures allowed for the continued logging of necessary habitat while providing superficial protection for the owls (Bingham & Noon, 1997).

Scientists argue that the scientific basis behind certain HCPs is precarious, offering examples of plans where key biological factors remained unclear and an ITP was still issued (Harding et al., 2001; Rahn et al., 2006; Shilling, 1997; Watchman et al., 2001). Rahn (2006), for example, found that 41 percent of the plans he studied included at least one species whose presence had not been confirmed within the plan area. The inclusion of a species without knowing its range is biologically reckless because HCPs tend to result in non-uniform land use, making it possible for occupied habitat to be destroyed while protecting less optimal habitat. Similarly, Harding et al. (2001) found that while 60 percent of the plans examined used all of the information categorized as “starkly necessary” in their plans, for 42 percent of the species examined there was insufficient data and analysis to clearly determine how take would affect the population.¹⁵ This suggests that while planners are utilizing the science available to them, they

¹⁵ Harding et al. (2001) use data and categorizations from Kareiva et al. (1999) which defines “starkly necessary” information as information which would have changed the conclusions of the plans quantitatively and substantially.

are not taking the necessary measure of conducting additional studies to ensure adequate protection. This notion is supported in Kareiva et al. (1999) who found that 75-85% of 208 plans included in their study utilized all data that was deemed significant¹⁶ and was available at the time of plan preparation. However, the same noted that all categories of data were not researched equally with 23% of the plans omitting information regarding cumulative impacts which would have altered the assessment of the impact on take (Kareiva et al., 1999, pg.18). The issuance of an ITP without a solid scientific foundation makes the integrity of the HCP process questionable, indicating that some plans work in favor of the economic considerations of the stakeholders at the cost of the covered species (Hood, 1998).

Whether intentional or as the result of careless planning or inadequate resources, the failure to use adequate science during the development of the HCP can lead to serious failures such as arbitrary and ineffective mitigation or minimization measures, inadequate quantity and quality of habitat conservation, and meaningless conservation benefits (Kareiva et al., 1999; Langpap & Kerkvliet, 2012). Lastly, there is no method for filtering the database by species, thus it is difficult if not impossible to accurately assess the cumulative amount of take for a particular species that has been allowed across plans. Without this data, local population estimates are used to calculate allowed take, making over-allocation of take for a species as a whole possible. These shortcomings can be compounded over long permit durations, with inadequate practices and adaptive management protocols protected by the “No Surprises” policy (Hood, 1998). Although citizens and environmental groups are permitted to sue the Services and/or the permittee to challenge the adequacy of the HCP, the courts rarely find in favor of the plaintiffs in such

¹⁶ Kareiva et al. (1999) categorized information which would have changed some quantitative solutions as “significant”

cases.¹⁷ Additionally, these lawsuits may do more harm than good for the species, costing the Services and plaintiffs huge sums of time and money in litigation which could have otherwise been allocated to species protection.¹⁸

Despite these drawbacks in the process, studies support the conclusion that species are likely to be better off protected under an HCP than if there was no plan in place (Kareiva et al., 1999; Rahn et al., 2006). Langpap & Kerkvliet (2012) encourage the continued use of HCPs, but advise that the process should be streamlined and that the USFWS's Habitat Conservation Planning grants program should be expanded to make development of HCPs more affordable for the applicants. This is an important consideration due to the high costs associated with the staff and research necessary to develop a plan. Kareiva et al. (1999) recommend that a formalized scheme be adopted, so that simple HCPs with objectives that are generalizable or common can easily draw on data analyses from similar HCPs; that HCPs with a potentially large impact include more quantitative biological goals and take predictions; that information about listed species be maintained within a centralized database for easy access; and that a scientific advisory committee be required for independent peer review to prevent political or economic agreements that ignore critical science. Rahn et al. (2006) suggest the standardization of scientific and legal criteria and the identification of information gaps during the planning process in order to highlight areas of high uncertainty. While these recommendations would certainly strengthen the conservation efficacy of future HCPs and align with the clearly stated goals of HCPs discussed in more detail below, it remains to be seen if such measures would be well received by those applying for ITPs.

¹⁷ For further discussion of HCP court cases, see Chapter 2 "Opposition"

¹⁸ From March 2001 to September 2010, the Department of Interior paid \$21,298,971 in attorney fees and costs associated with ESA cases; the entire USFWS budget for the fiscal year of 2013 was \$22,431,000. Although these costs cannot be contributed solely to cases regarding HCPs, it demonstrates the costly nature of lawsuits and highlights the desire to avoid such costs.

HCP Development

HCPs can vary in size and scope, which is typically correlated with the NEPA documentation required to accompany the plan. A low effect HCP is appropriate for landowners whose activities will have “minor or negligible effects” on listed species and other environmental values or resources (*Habitat Conservation Planning Handbook*, 1996, p. 1.8).¹⁹ These HCPs have fewer processing requirements, do not require a NEPA analysis,²⁰ and have a target approval time of three months after the Section 10(a) application has been submitted to the FWS. They are appropriate for small landowners²¹ who may not have the resources to withstand a long delay in permitting (*Habitat Conservation Planning Handbook*, 1996, pp. 1.8-1.9). Alternatively, HCPs can be developed by one or more permittees, cover one or more species, and cover any amount of geographic area.

The largest and most complex of these plans are Regional HCPs which cover large geographic areas, can include multiple applicants, and are meant to address entire natural communities. The target processing times will vary depending on the size and complexity of the HCP; the permit processing time for an HCP requiring an EA is targeted to take three to five months from the time of the completed application package to the issuance of the ITP while HCPs requiring an EIS are targeted to take less than ten months (*Habitat Conservation Planning Handbook*, 1996, p. 1.14). While there are varying sizes and complexities of plans, regional HCPs are the most difficult and complex to prepare; the Services encourage the use of these complex plans, however, saying that they are more effective and require less processing than

¹⁹ Low-effect HCPs are determined on a case-by-case basis using considerations such as the total number of individuals impacted by the covered activities.

²⁰ The Service is required to prepare an Environmental Action Memorandum (EAM) describing why the action was categorically excluded.

²¹ Plans covering geographically small areas with a single applicant are the most common low-effect plans, however, plans covering large geographic areas can still be considered low effect if the impacts of the take are negligible to the species as a whole. Conversely, geographically small plans would not be considered low effect if populations essential to the survival of the species were located on the land.

multiple smaller plans (piecemeal planning) within the same planning area (*Habitat Conservation Planning Handbook*, 1996, p. 1.15)

There are five phases that are standard to the HCP planning process: pre-application, HCP development, environmental analysis and documentation (NEPA), application, and implementation. During the pre-application phase the applicant(s) should develop a steering committee, determine the scope of the HCP (geographic area and species to include), and begin consultation with the appropriate Service whether it be USFWS or NMFS (*Handbook*, 1996, Ch. 3-A). While not legally required, steering committees are useful for managing diverse interests in regional HCPs where multiple stakeholders will be involved. The committee should reflect these diverse interests and be composed of a variety of stakeholders including local government officials, land owners, academics, environmentalists, engineers, and/or other professionals who may be useful to the development of the HCP. This committee should be chosen carefully, as it will advise the applicant(s) throughout the HCP development process (*Handbook*, 1996, pg. 3.3 – 3.5). In the case of large, complex HCPs, subcommittees can be useful for addressing specific components within the overall plan. These can be technical, advisory, or biological committees that will assist with the development of the HCP in the areas of their expertise.

Once the committees are assembled, the mandatory elements of HCPs must be considered. The impacts on the target species must be assessed before plans for mitigation can be developed. In order to do this, the developers should clearly delineate the boundaries of the project area in order to prevent confusion. Only species with individuals or populations within the project area should be considered in the HCP. Any species (threatened, endangered, or unlisted) may be covered in an HCP, however, at least one of the species must be federally listed as endangered. Many times it is beneficial to include non-listed species if they are at risk of

being listed in the future as they will benefit from the management measures and will automatically be covered by the protections and assurances guaranteed by the ITP should they be listed during the permit's duration. Next, studies should be conducted to acquire as much biological data as possible for the covered species. Sheltering, feeding, and reproduction behaviors are essential to the survival of any species, and should be well understood before the project can begin (Orton-Palmer, 2013). Finally, the project developer must present a clear idea of the specific activities that are expected to occur in the planning area which will result in incidental take, are reasonably certain to occur over the lifetime of the permit, and for which the applicant(s) has some form of control (Handbook, 1996, 3.10 – 3.12).

With the project activities clearly laid out and a strong biological understanding of the species obtained, the amount of take which will occur should be reasonably quantifiable. This determination should include both the type of take (ex: injury/death, harm, harassment); how it will occur (ex: crushing by machinery, fragmentation, noise disturbances); how the take will be measured (ex: number of individuals, units of habitat) and how the take will be calculated (ex: stream temperatures, number of acres occupied). Additionally, the level of take expected to result must be established as well as the level of take that the Section 10 permit will actually authorize. There will be many uncertainties during the determination of take, but a well-developed adaptive management plan, discussed later, should provide protection for the permittee as well as the covered species in case the take was miscalculated.

After the take is quantified, the committees may begin to develop the mitigation plan and standards. These plans must be based on the "best scientific and commercial data available," as with the listing process. There is no set of pre-approved mitigation measures, but common practices can be found in Table 1.1.

Table 1.1: Examples of Mitigation Practices

Common Practices for Mitigation	Mitigation Achieved
Project Relocation	Eliminate need for mitigation
Timing/scheduling restrictions, buffer zones	Minimization of impacts
Restoration/re-vegetation	Retroactive mitigation, rectifying the impact
Relocating individuals to superior habitat, purchasing of conservation bank credits	Compensation for impact
Conduct proper management and monitoring	Reduce impact over time

Once an appropriate mitigation strategy has been formalized, the applicant(s) must establish a monitoring program. This can include any combination of reports to the FWS at a set time scale (yearly, monthly, every two years, etc. as is appropriate for the HCP) including maps that show the locations of active populations and with their current standing (declining, improving, no change), inspections of property to make sure land managers are in compliance, and/or financial auditing to make sure fees/funds are being managed correctly. Whatever the monitoring scheme, it should provide clear indications of the ecological and financial success or failure of the HCP implementation. Precise monitoring will influence the trajectory of the HCP, as adaptive management measures may be triggered as a result of monitoring findings (Handbook, 1996, 3.25).

Adaptive management is defined as “a decision making process that promotes flexible decision making that can be adjusted in the face of uncertainties as outcomes from management

actions and other events become better understood” (Williams, Szaro, & Shapiro, 2007).²²

Adaptive management procedures are included within HCPs in order to minimize the uncertainty associated with the future of covered species. The inclusion of adaptive management allows the plan to mold and change as the needs of the covered species change, thus becoming vital to the success of plans. It is especially critical in cases where gaps in the scientific knowledge of a species are present, as the response of those species to the implementation of the plan will be less predictable (Handbook, 1996, 3.24). By including an exhaustive adaptive management section, the biological objectives of conservation can be met, even if the plan begins to fail, without breaking the ‘No Surprises’ rule.²³ Lastly, the ESA requires that HCPs provide a detailed funding report, outlining how and when the various management policies of the conservation plan will be financed. The ITP will not be issued if all of the above criteria are not met.

Once completed, the applicant(s) submit their name(s), the application fee of \$25, and the application form (3-200) with the draft HCP to their respective Service. When the full application is received, the Service must then follow certain procedural steps before the ITP can be issued: First the draft will be reviewed to ensure it meets Section 10 requirements,²⁴ the process of which initiates Section 7 requirements and NEPA; an implementing agreement (IA) may be completed²⁵; and lastly, the HCP must be made available for public comment along with the NEPA document and the application. An IA is a document signed by the applicant(s) and the

²² The full definition of Adaptive Management as defined by the DOI can be found in the Definition of Terms.

²³ Once issued, an ITP assures the permittee(s) that no future monetary obligations will be required of them, except in the case of jeopardy (63 FR 8859, February 23, 1998).

²⁴ Section 10 requires that the permit application detail the (i) impacts likely to result from the proposed taking of the species; (ii) the measures the applicant will undertake to monitor, minimize, and mitigate such impacts, the funding that will be made available to undertake such measures, and the procedures to deal with unforeseen circumstances; (iii) alternative actions considered by the applicant that would not result in take and the reasons why such alternatives are not being utilized; and (iv) additional measures the Services may require as necessary or appropriate for the purposes of the plan (*Habitat Conservation Planning Handbook*, 1996, p. 3.10).

²⁵ Although applicants are able to request an IA, the decision to create one is entirely up to the discretion of the Regional Director.

FWS that states exactly how the HCP will be implemented, including a description of the duties, benefits, and responsibilities of all of the parties involved. It legally binds the signatories and their successors to HCP compliance. IAs are not required to make an HCP legally binding, but provide a concise outline of the HCP and can give applicants a sense of assurance that all ends of the deal will be upheld. These are especially useful in large scale or regional HCPs, long-term HCPs or HCPs with complicated programs (*Habitat Conservation Planning Handbook*, 1996, p. 3.36).

While processing the permit and completing an IA, the Services must simultaneously complete a National Environmental Policy Act (NEPA) document. The issuance of the permit is a federal action and this is the impetus for the NEPA process (40 CFR §§ 1500-1508). The NEPA document is meant to force the acting agency to consider the environmental issues surrounding its action so that it may reach a decision that reflects NEPA's mandate "to strive for harmony between human activity and the natural world" (*Habitat Conservation Planning Handbook*, 1996, p. 1.6). The document is similar to the HCP in many ways, but its differences are important to note. First, the NEPA document has to evaluate the impacts of the proposed development on the human environment as well as the direct, indirect, and cumulative impacts towards the covered species. This means that it must evaluate the proposed take and the protective measures provided in the HCP in coordination with other federal laws such as the Migratory Bird Act and the Clean Water Act. Additionally, the NEPA document is the responsibility of the relevant Service's office rather than the applicant, although document preparation is often times contracted out to consulting firms. Finally, the NEPA document only

makes recommendations for actions; it does not require that the applicant implement those recommendations²⁶ (Table 1.2).

Table 1.2: Documentation Required for an HCP under the ESA vs. NEPA

Document Content: HCP vs. NEPA		
Content	HCP	NEPA
Proposed Action	Defined by Applicant	Defined by FWS
Environmental Setting	Species affected	All resource elements affected
Mitigation	Required	Recommended for significant impacts
Monitoring and adaptive management	Required	Recommended
Funding Assurances	Required	Not required
Alternatives	To the taking	Reasonable range meeting purpose and needs
Decision Document	Findings and Recommendations	Finding of No Sig. Impact (FONSI) or Record of Decision (ROD)

There are multiple levels of NEPA documents, each requiring unique considerations. An Environmental Action Memorandum is issued with a categorical exclusion, or a finding of “a category of actions which do not individually or cumulatively have a significant effect on the human environment...and for which...neither an EIS or and EA is required” (40 CFR 1508.4) and is used for low-effect HCPs. If no exemption is found, an environmental assessment (EA) will take place in order to establish the necessity of an Environmental Impact Statement (EIS) or a Finding of No Significant Impact (FONSI).

The production of the NEPA document provides the only required opportunity for public participation in the development of plans. Before the creation of an EA or EIS, there is a public

²⁶ Although applicants are not required to act on the recommendations of the NEPA document, they must continue negotiations or abandon the HCP if the Services do not find the plan satisfactory.

meeting and 30 days of public scoping. Once the application, draft HCP, NEPA analysis (EA or EIS), certification by the Field Office that the HCP and associated documents are statutorily complete, and the IA (if requested) are complete, the Federal Registry Notice can be published and the public comment period may begin. EAs require a 60 day public comment period. If an EIS is needed, there are two additional public comment periods: 90 days for public comment after the EIS draft is published and 30 days for public comment after the final EIS is published. These periods of public participation guarantee the opportunity for at least a minimum level of public participation in the HCP process. At the end of the process, the Service must issue a biological opinion. If the Services conduct an EA, the process culminates in either the decision to prepare an EIS or the issuance of a FONSI, which allows the project to proceed. If an EIS was produced, a record of decision (ROD) must be issued before the project is allowed to go on. Although these processes are strongly encouraged to take place during the public comment period, they may not be finalized until after the public comment period has ended (Handbook, 1996, 6.7).²⁷ While this method of parallel construction expedites the processing of the HCP and allows the Services the chance to edit their finding based on the public comments, it does call into question the amount of consideration given to the public comments by the Services.

Once the NEPA documents have been issued, the ITP must be issued by the Secretary if the scientific, financial, and legal criteria discussed previously have been satisfied. If the ITP is rejected, the applicant(s) can request reconsideration. If the applicant is rejected a second time, the decision is final. Appeals are considered by officials who are superior to those which initially denied the ITP. ITPs can be denied with no chance for appeals if the applicant has been

²⁷ By constructing the final findings during the public comment period, the Services are able to expedite the HCP process, but this parallel construction method calls into question the seriousness of consideration given by the Services to the public comments, even if the Services retroactively edited their findings to address concerns from the public.

convicted of a crime relevant to the covered activities on the HCP, if they have failed to show valid justification for the permit, if the authorization of the permit would put the species at risk of jeopardy, or if the applicant does not have the legal authority to conduct the covered activities (Handbook, 1996, 6-26).

Conclusion

When properly executed, HCPs provide structure and clarity while simultaneously encouraging flexibility and creativity in the protection of biological and economic interests. HCPs can resolve the biological concern of ecosystem and habitat protection while providing economic security for landowners. Despite these benefits, the complex process and voluntary involvement of the public with HCP production (Doremus, 1997) can potentially contribute to a feeling of exclusion amongst those not involved. This feeling of isolation can then lead to lawsuits against implemented plans or public opposition to plans being pursued by local governments. Individual HCP developers can address this issue by choosing to involve stakeholders throughout the process or to provide opportunities to educate the public about the process, although there is no legal obligation to do so. The Services must also be responsible for ensuring that plans fulfill the law's obligation to use the best available science. Although some of these issues may be addressed in the upcoming revised HCP Handbook (publication date to be determined), as the process currently stands, it is possible for inadequate science and low public participation to diminish the efficiency of plans (Langpap & Kerkvliet, 2012; Rahn et al., 2006; Rohlf, 2005). Public input can offer unique and valuable views and aid in holding the FWS and HCP permittees accountable for their actions (Doremus, 1997). There is still much work left to be done in improving the development and implementation of HCPs, especially as they remain a popular tool for species protection.

CHAPTER TWO

AQUATIC HCPS

Introduction

The connectivity of aquatic habitats to their surrounding terrain and waters makes aquatic HCPS especially challenging to develop. Applicants cannot solely consider water or land management solutions, but must consider the interplay between these two activities when creating an aquatic HCP. Whereas terrestrial HCPS can rely on the creation of reserves as a management tool, aquatic HCPS are limited in this capacity. Reserves are effective in some cases, as seen in the Cedar Creek Watershed HCP discussed below, but they are plausible only in specific scenarios. Reserves are typically not sufficient to address issues of urbanization due to the large amount of land which would be required to adequately protect most species (Wenger, Freeman, Fowler, Freeman, & Peterson, 2010). The price of land and the sociopolitical ramifications of taking developable land off the market are prohibitive. Many endangered aquatic species are highly sensitive to alterations in their habitat; changes in water temperature, hydrologic levels, sedimentation, and contaminants can all be the result of land management practices occurring well beyond the land directly adjacent to the aquatic habitat. Because of this, aquatic HCP plan areas generally cover headwaters²⁸ (if the species does not occur further downstream) or large swaths of the watershed²⁹ to avoid the risk of failure due to activities outside the applicant's control.

²⁸Ex. Edwards Aquifer HCP, discussed in more detail below.

²⁹ Ex. Cedar River Watershed HCP, discussed in more detail below

The range of an aquatic species dictates the size and scope of a plan. Anadromous fish require a large array of habitats and conditions in order to complete their lifecycle. Many of the HCPs in the western US are established to protect these species. Few of these plans account for the entire range of the covered fish; many rely on associated agreements with adjacent landowners (including federal and state agencies) within the watershed to ensure the species is protected throughout its range. Alternatively, an HCP can cover the entirety (or majority) of a population's range, as is the case with the Plum Creek Native Fish HCP, whose permittee was the largest private owner of bull trout habitat within the species range at the time of HCP development (Plum Creek Timber Co., 1999). While non-migratory species do not create as much of a spatial challenge, the delineation of the areas of greatest impact can be difficult.

Aquatic HCPs are more prevalent in the western regions of the United States, where HCPs first were established. There is significantly more public land in the West, which makes it easier for state or local agencies to produce and implement large HCPs without impacting private property. Additionally the HCPs implemented in the West have traditionally covered forestry related activities, rather than activities related to water supply (See Appendix A). Landowners can more easily mitigate these activities through well-established Best Management Practices (BMPs), which allow for the continued harvest of timber while keeping riparian habitat highly intact and stable. My study suggests that these historical trends may be changing, however, as Region 8 is currently developing the Bay Delta HCP, a large-scale water management plan aimed at ensuring adequate water supply is available for a growing human population while protecting nine aquatic species.

In the eastern United States, applicants must navigate a more complex sociopolitical dynamic in order to create aquatic HCPs. Most land is privately owned, meaning that in order to

create an aquatic HCP there will need to be high levels of coordination and participation amongst a disparate group of stakeholders (*see* Edwards Aquifer HCP, Cumberland HCP case studies).

The difficulty of this process is evident by the fact that only three aquatic HCPs have been successfully implemented in the eastern half of the United States, all within the Great Lakes Region (Figure 2.1). The covered activities of these plans are different from those in the West and include groundwater pumping, cooling water discharge from a nuclear power plant, and the operations and maintenance of natural gas transmission (Appendix A). These covered activities are the result of increasing resource demands from a growing population rather than forestry related activities. In fact, a recent study has found that net forest-cover is declining in the eastern US due to timber cutting cycles, urbanization, mining, and reservoir construction out-pacing forest-gains from abandoned agricultural fields, shrublands, and grasslands (Drummond & Loveland, 2010). The mid-west regions fall somewhere between these two extremes, with covered activities ranging from rural grazing to urban water supply and hydrologic concerns.

My study analyzes 25 permitted and five under development aquatic HCPs; these are plans that have primarily stream or lake dwelling species as their covered species.³⁰ The plans range widely in size of the geographic plan area, number of covered species, covered activities, number of applicants, management measures used, time taken to receive a permit, and funding mechanisms employed. Additionally, the plans vary structurally, with no standardized format or content beyond recommendations provided by the USFWS's HCP Guidebook (1996) and its Five Point Policy (65 FR 35242, June 1, 2000). The lack of standardization provides the flexibility required to shape plans as needed for unique situations, but also leaves the decision to permit or not permit a plan largely up to the discretion of the individuals within the Services'

³⁰ This is only a subset of aquatic HCPs. Marine, wetland, and vernal pool species are also covered in aquatic HCPs, although they are not included in my study due to space and time constraints as well as issues of relevance.

field and regional offices, creating the potential for substandard plans to be approved (and leaving the Services open to lawsuits as discussed below). The inconsistencies between plans make comparing and contrasting them an arduous task. One of the goals of this chapter is to provide a synthesis and analysis of the plans in an easy-to-navigate format.

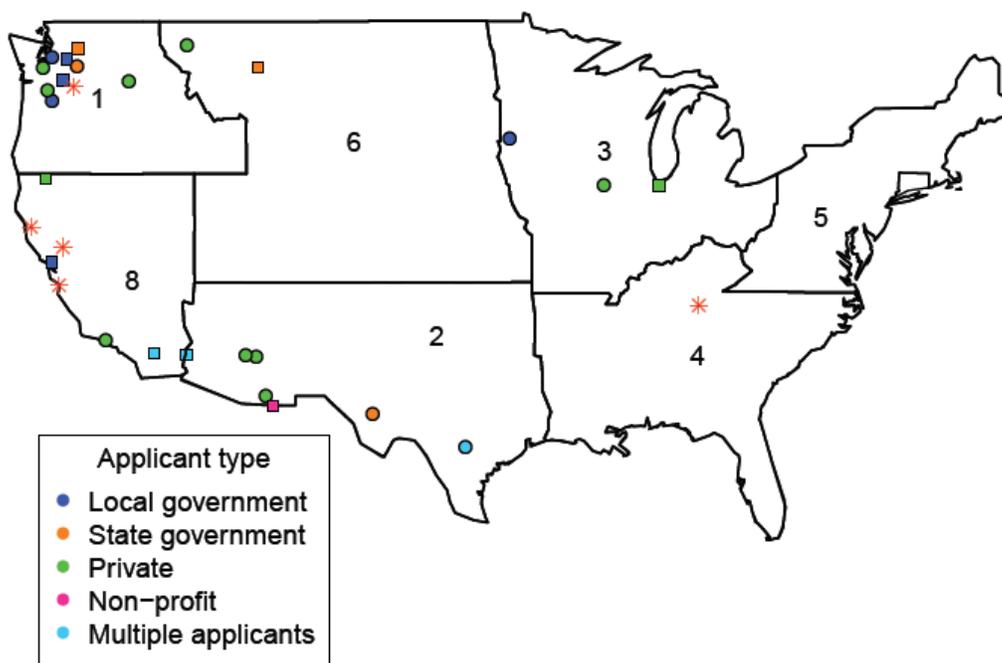


Figure 2.1: A map of the USFWS Regions showing implemented HCPs that cover only aquatic species as circles and those that cover both aquatic and terrestrial as squares. The asterisks represent plans which are still under development.

Plan Characteristics

Plans and Associated Documents

There are 30 plans included in my study; 25 permitted and five which are in the process of being developed or permitted. The plans occur in six of the eight USFWS Regions (Figure 2.1); of these, ten are in Region 1, seven in Region 2, three in Region 3, one in Region 4, three in

Region 6, and six are in Region 8. There are a number of plans that reach across two or more regions, such as the NiSource Multi-species Habitat Conservation Plan; these plans are considered only once in the count and are listed under the numerically first Region. These plans also can include any number of species (animal and plant), either aquatic or a combination of aquatic and terrestrial.

When applying for an ITP, applicants must include a series of documents including the draft HCP, application, documentation of funding assurances, and any additional documents requested by the Services. Plans can include an Implementation Agreement (IA) if there are multiple entities participating in the development of the plan and the Services want to include one. Certificates of Inclusion (COI) are documents that accompany programmatic HCPs.³¹ The Malpai Borderlands HCP is an example of a programmatic plan that also utilizes an IA. The plan has a single applicant (the Malpai Borderlands Group, a non-profit coalition of conservation oriented ranchers) who is responsible for administering the HCP, but several local and state government agencies in New Mexico and Arizona were signatories to an IA. By signing the IA, the signatories agreed to implement specified measures of the HCP on their lands.³² The Malpai Borderlands Group is responsible for issuing COIs; recipients are rancher landowners within the plan area who voluntarily join the HCP. The Malpai Borderlands Group is responsible for permitting the activity and enforcing compliance with the HCP. This process helps avoid the need for duplicate HCPs.

The Services are responsible for completing the associated NEPA document of a Categorical Exclusion, Environmental Assessment or Environmental Impact Statement. A Categorical Exclusion exempts the plan from undergoing further NEPA assessment; it is issued

³¹ A programmatic HCP is a plan which individual entities can adopt and gain coverage under the ITP without being official ITP holders.

³² The Cedar River Watershed HCP, discussed in detail below, is a second example of a plan which utilizes an IA.

along with the ITP if an HCP is deemed to be a low-effect HCP. There were six low-effect HCPs within my study; all were single applicant plans, covering 1-3 mildly disruptive activities.

Environmental Assessments are required for plans with covered activities that are not going to have a significant impact on the covered species, but are of sufficient size, scope, and/or duration to warrant further analysis. There were four plans in the study which included EAs (See Appendix A). The Broughton Land Company and El Coronado Ranch HCPs are similar in that they are both small HCPs focused on limiting the impacts of grazing, farming, and/or ranching on the covered species. The Cedar River Watershed HCP covers over 80 species and a large geographic area, but the activities will have a negligible impact on the species; many of the covered activities are conservation and restoration measures.³³

The remaining 15 permitted aquatic HCPs required the production of an Environmental Impact Statement because the covered activities were deemed to have a significant impact on either the covered species or on the human environment (See Appendix A). EISs are required when a significant population of an endangered species is in the plan area or if the combination of land included in the HCP, number of applicants, the severity of the covered activities, and/or length of the permit duration are considered substantial enough to have significant impacts on the species. The NiSource Multi-Species HCP has a single applicant, the NiSource Company, and is fully contained on the applicant's private lands; however, the plan extends across three Service Regions from Louisiana to New York. The sheer size of the HCP increases its likelihood of significantly affecting a listed species, making it an appropriate candidate for an EIS instead of an EA.

³³ Landowners must receive an ITP for restoration and conservation measures when a listed species is present because conservation and restoration aimed at a different species or executed incorrectly can cause harm to the listed species.

The Lower Colorado River Multi-Species HCP includes almost identical covered activities and similar management terms as the Cedar River Watershed HCP, but it required an EIS instead of an EA because of the political boundaries crossed in the HCP. The entirety of the Cedar River Plan is located within the City of Seattle's jurisdiction, while the plan area of the Lower Colorado Plan is much larger and covers three state jurisdictions, with 28 federal, state, and local public agencies and six tribes included in the planning process. The Storedahl Gravel Daybreak Mine Expansion & Habitat Enhancement Project HCP (Storedahl HCP) is an example of a plan that required an EIS based on the covered activities of the plan. While the previously mentioned plans include water withdrawal and conservation strategies as their covered activities, the Storedahl HCP covers activities for gravel mining and processing. These activities result in erosion and wetland/riparian habitat degradation and direct mortality of individuals, thus significantly impacting the aquatic populations found there. The management terms used to mitigate that take include offsite habitat construction and restoration.

Timing

The Services designated a timetable for the completion of NEPA documents when they created the HCP Handbook. Low effect HCPs should take approximately three months to process, EAs should take approximately six months, and EISs should take approximately one year to process from the submission of the application to the release of the ITP (*Habitat Conservation Planning Handbook*, 1996, pp. 1.8-1.9). The sampling of aquatic HCPs within my study suggests that the Services regularly fail to meet those time objectives. The processing time could be determined for four of the six low effect plans; the timeframes were three, twelve, fifteen, and thirty-one months. Despite the relatively uniform impact of these plans on the covered species, there are large discrepancies in their processing with only one being completed

within the designated timeframe. It is likely that a combination of factors cause this discrepancy. For example, a plan located in Region 1 that covers 14 species took 15 months to be processed while a plan in Region 3 covered only one species and took three months to process. Typically, I would expect a plan to be processed more quickly in Region 1 due to the high number of plans processed annually in the region, however, the inclusion of so many species likely contributed to the delay. Not all of the variability can be explained by the number of covered species or region, however. The outlying low effect HCP only covered two species but took 31 months to process. This delay may have been caused by the mitigation strategy of population augmentation, which carries with it a higher level of uncertainty than other management practices.

HCPs requiring an EA have a target permit processing time of six months. Two of the four aquatic plans with EAs did not provide the ITP application submission date. The submission date is important due to the lag time between the submission of the plan by the applicant and the publication of the plan and associated documents to the Federal Register. The Cedar River Watershed HCP application was submitted in December of 1998 and the ITP was issued 16 months later in April of 2000. The Malpai Borderlands HCP application was submitted in 2006 and the ITP was issued in 2008, a total of 23 months later. The remaining aquatic HCPs required the completion of an EIS, the timing of which ranged between three and eight years, with the majority being processed within five years (See Appendix A).

There are many variables that can explain the inconsistency in the time it takes to process an application. Some HCPs are simply longer and more complex than others, requiring more time to review. An example of such a plan is the Cedar River Watershed HCP; the plan only required an EA, but was over 1000 pages in total and included protections for over 80 species, addressing 14 of those species specifically. Some, such as the Edwards Aquifer HCP, require the

enactment of state or local laws or regulations which can increase the amount of time an HCP spends in legal review. The Regional Office can affect the length of time required to process an HCP; each Region's efficiency is subject to budget constraints and staffing limitations. Regions where HCPs are common will typically have more staff members devoted solely to HCPs while Regions that receive fewer submissions of HCPs, have fewer staff devoted solely to the processing of such plans. For example, Region 8 has two regional coordinators of HCPs while the remaining regions have just one. The applicants themselves can cause a delay in the permitting. The Alameda Watershed HCP, for example, has been under development for 14 years as of 2014. This delay is not the result of activities by the Services, but rather is the result of the applicant's indecision over various aspects of the plan (Wilson, 2014).

Political complications, both internal and external to the planning process, may also dictate the speed of project completion. Political complications within the HCP planning process arise when there are multiple applicants and/or the plan reaches across political borders. Cooperative agreements can be time consuming to forge and fragile once made. The development and/or processing of an HCP can be delayed if an applicant withdraws from the process, comes on late, or alters the terms they agree to. An example of an aquatic HCP experiencing internal political complexity is the Cumberland HCP, discussed in detail below. Outside complications can be even more frustrating, as they are out of the control of either the applicant or the Services. An example of an outside political complication is the petition against the USFWS which resulted in Region 4 being tasked to make a determination on more than 700 petitioned species within a court mandated timetable (In re Endangered Species Act Section 4 Deadline Litigation, Settlement Agreement, MDL Docket No. 2165 1:10-mc-00377-EGS (May 10, 2011)). The Region is under a legal obligation to make a designation for those species, while

they are under no such obligation to make decisions on HCPs. As such, the regional office will prioritize the court-mandated determinations over HCP processing (Dell, 2013). Additionally, since pressure from politicians has been shown to influence the speed at which listing determinations are made (Harlee, Kim, & Nieswiadomy, 2009), it is possible that similar political pressures could influence the speed of HCP processing, as was the case for the Etowah HCP. All of these variables can help explain the inconsistency in the time it takes to process an HCP application.

Public Participation

Public participation beyond the NEPA public comment period is not required within the HCP process, although it is highly encouraged within the HCP Handbook. There are many ways in which the public can be involved in the development and implementation of an HCP. The applicants can hold public meetings; make committee meeting minutes available to the public; invite scientists, academics, and conservationists and others to serve on committees; publish regular newsletters updating the public on the progress of the plan; and/or enlist entities outside of the HCP to contribute to research and monitoring. Despite its voluntary nature, public participation was a large component of many of the plans in my study; it was not heavily utilized for the low-effect HCPs or for most spatially small, privately-funded and executed plans. Single applicants with plans covering a spatially large area also tended to utilize public participation throughout the process, indicating that they believed they would benefit from public participation, either through creating a more comprehensive plan or by decreasing the likelihood of a lawsuit.

Covered Species

The only rule regulating the inclusion of covered species is that one of the species must be endangered; beyond that, applicants have full flexibility in choosing their species. Plans can cover a single species or can cover hundreds; they can cover species of a purely aquatic nature, purely terrestrial nature, or a combination of the two. The HCP Handbook (1996) recommends balancing the proactive inclusion of unlisted species with the time-intensive over-inclusion of species unlikely to become listed in the future. Species which are likely to benefit from the plan, but which are not formally covered, can still be included within the plan informally.³⁴ In my study, the number of species included in the plans ranged widely from a single species to 83 species. There were significantly more plans that covered five or more species than plans that covered fewer than five species. The plans just barely favored covering strictly aquatic species (15) versus covering both terrestrial and aquatic species (10). Some of the plans that were limited to aquatic species had a sister plan which covered forest or terrestrial species in the same area.

Opposition

As mentioned in the previous chapter, HCPs are frequently the subject of criticism and opposition; aquatic HCPs are no exception. Lawsuits against the Services for approving HCPs are not uncommon, although difficult to win. Countersuits questioning the plaintiff's standing are also common, with all courts reasserting the right of the public to sue in regards to the ESA. An example of such a claim is *Plum Creek Timberlands Co., Inc v. Trout Unlimited* (2003) where Timberlands sued Trout Unlimited for filing a notice of intent to sue the Services for approving the Plum Creek Native Fishes HCP. The notice of intent was filed in an attempt to open dialogue

³⁴ Informally covered species are typically species that are not yet listed under the ESA, but are included because of similar habitat requirements as covered species. They are discussed within the plan and are monitored during the plan duration, but the applicant does not receive take allowances for them. It is beneficial to include these species informally because it does not restrict the applicant from taking them and it creates a model plan in case the species is listed in the future.

to strengthen the plan through an out-of-court settlement rather than to actually appear in court (Bulletin, 2003). Timberlands countersued the conservation groups, seeking a declaratory judgment as to the validity of the HCP and demanding attorney fees from the conservation groups. Federal judges found in favor of the conservation groups, reinforcing the right of the public to participate with the implementation and enforcement of the ESA ("Plum Creek Timberland Co., Inc. v. Trout Unlimited ", 2003). Although the harassment suit against the conservation group was dismissed, Trout Unlimited did not pursue their case against the Services further, likely due to the animosity that developed during litigation. In some cases the threat of a lawsuit may encourage cooperation between parties in an attempt to avoid a lengthy and expensive trial, although it was unsuccessful for Trout Unlimited.

Although it is not uncommon to use the threat of a lawsuit to open up dialogue between opposing parties, there are certainly lawsuits that result in trials rather than consensus-building. These lawsuits are almost exclusively filed by environmental groups ("Center for Biological Diversity v. USFWS," 2002; "WildEarth Guardians v. USFWS," 2009) or citizen groups ("South Yuba River Citizens League v. National Marine Fisheries Service ", 2009). The most common claim made against the Services is for approving an HCP that the plaintiff believed to be inadequate on the grounds of insufficient funding ("National Wildlife Federation v. Department of Interior", 2005) or inadequate science ("Center for Biological Diversity v. USFWS," 2002). The majority of these cases are resolved in favor of the Services; the burden of proving that the Services acted in an arbitrary or capricious manner rests with the plaintiff. There have been a few situations in which these claims have been substantiated.³⁵ Cases challenging a procedural failing

³⁵ Southwest Center for Biological Diversity v. USFWS (2006) is an example of a successful case brought against the Services. The approval of the HCP was found to be arbitrary due to the Service's failure to analyze the impact of the city's development plans on vernal pool species before they locked in the level and extent of the mitigation. Additionally, the courts found that the Service's approval of the funding scheme was arbitrary, as there was no

("Gerber v. Norton," 2002) or permittees for take through an activity not covered in the HCP ("Loggerhead Turtle v. County Council of Volusia County, Fla.," 1998) have been more successful, as these activities are easier to prove in court.

Permit Duration

Once implemented, HCPs are not meant to extend into perpetuity, but expire after a set amount of time.³⁶ The permit duration varies, ranging from seven months to 100 years (Kareiva et al., 1999). This wide range can be attributed to its implementation date, the size and scope of the plan, and the preferences of the Services and applicants. Despite this range, 60 percent of the 208 permits from the study done by Kareiva et al. (1999) were designed to expire within 20 years. This trend was mirrored in my study, with most permits expiring in 20 to 50 years from issuance. However, in some Regions, the Services are encouraging shorter permit durations, especially as plans are being created to address urbanization and water supply. Plans addressing these less commonly covered issues will involve greater uncertainty regarding the success of the plans and should expire more quickly than plans utilizing well established methods. The Edwards Aquifer HCP is an example of a plan with a 15 year permit, a time period long enough to implement the complex management measures and gauge their success before the plan is due for renewal.

Alternatives to the HCP

Every plan is required to include potential alternatives to the plan and explain why those alternatives were not pursued. The applicant is allowed to include as many alternatives as they

guarantee that adequate funding would be provided. In this case, the Services and applicant were required to reinitiate review of the plan, specifically, the protections for the vernal pool species and the funding. The plan was amended, reviewed and approved. The plaintiffs challenged the amended plan, but the courts found in favor of the Service.

³⁶ There are two plans on private property in Texas that are to be maintained into perpetuity. These plans, along with the 100 year permit, were permitted relatively soon after Section 10 was implemented. The Services no longer promote such long term periods.

feel are appropriate, but two alternatives are required: No Action and No Take Alternatives. These alternatives represent the two extremes which the HCP is designed to avoid. The No Action Alternative explains the current conditions of the plan area and covered species and the expected impact of future activities on the species if no HCP is in place. This alternative usually results in take of the species and highlights the need for the HCP development. The No Take Alternative represents the scenario which would take place if Section 10 had not been added to the ESA – it describes the economic hardships and extreme limitations which would be imposed if the applicant was not allowed any take. The result is typically impractically expensive or restrictive for the applicant. These alternative scenarios illustrate the need for the compromise that the HCP offers. Although most applicants only address these two extreme cases, applicants can chose to include alternatives that remove or alter one or more of their management terms. The Cedar River Watershed is an example of a plan that offers three alternatives which would result in no take, each alternative focusing on a broad management protocol, rather than having one alternative plan that would result in no take.

Plans Currently Under Development

There are five aquatic HCPs still under development at the time of my study: The Alameda Watershed HCP, The Cumberland HCP, The Bay Delta Conservation Plan, The Washington Department of Natural Resources Aquatic Lands HCP, and The Mendocino Redwood HCP.³⁷ Despite its small size, this sampling of plans may provide insight to the future of aquatic HCPs as two trends are shared amongst all five – they are spatially large and cover multiple species. Despite these similarities, there remains a high level of diversity amongst applicant(s), covered activities, scope, and conservation measures. The location of developing

³⁷ It is likely there are more aquatic HCPs currently under construction, however, these HCPs are not listed on ECOS and the permittee is not required to publicize their progress until the draft HCP is completed.

plans also suggests a trend; four of the five plans are located in Regions 1 and 8. These numbers suggest that HCP development is continuing in its historical western US range. However, the development of Cumberland HCP in Region 4 is actually quite significant, since it will be the first of its kind in Region 4 (the southeast US) if implemented.³⁸

The large spatial coverage of the plans may be due to the benefit derived for the species as described by Langpap & Kerkvliet (2012) or at the convenience or personal preference of the applicant. The inclusion of tens of species in each plan, however, is contrary to the conclusion that “there is no strong evidence that plans with more additional species have larger positive impacts on recovery...if monitoring and conservation resources have to be spread more thinly and all species on the plan are not effectively provided for” (Langpap & Kerkvliet, 2012, p. 14). This disconnect suggests that there may be unidentified motives for pursuing multi-species plans such as streamlining administrative duties, appealing to the public, or allowing the applicant to take more species with the least amount of paperwork. A plan covering many species may take longer to process than individual small plans, but will also require less paperwork, public comment periods, and other processing delays than producing multiple plans covering fewer species each.

There are five plans under development discussed in my study. The Alameda Watershed HCP is being developed by a single applicant, the San Francisco Public Utilities, in order to avoid, minimize, and mitigate impacts caused by the continuation of their water system operations, and recreation, lease, and easement activities. The HCP is proposed to include four populations of fish species, three amphibians, and six other fauna species in addition to five plant species. The plan area will span 36,816 acres of a 47,800-acre watershed. The process began in

³⁸ A similar plan, the Etowah HCP, was developed in Region 4 but was never implemented. For more information on the Etowah HCP, see Chapter 3.

2002, when the San Francisco Public Utilities decided to rebuild major components of their water system. The original intent was to include the rebuild in the covered activities along with the water system operations, recreation, lease, and easement activities covered in the current draft. Later, the applicant dropped the water system reconstruction from the covered activities in favor of a Section 7 consultation, which was deemed to be more efficient (Wilson, 2014). The applicant also struggled with the decision to include fish species in the HCP. Water projects downstream were being undertaken which would allow previously absent fish, including the endangered steelhead (*Oncorhynchus mykiss*), to re-occupy streams within the plan area. The uncertainty surrounding those projects led to the exclusion of fish and then the subsequent re-inclusion of the fish species into the HCP. The indecision of the applicant significantly increased the amount of time and money spent constructing the draft (Wilson, 2014).

The applicant published draft chapters of the HCP to their website as they were completed between 2010 and 2012 in order to foster a high level of public participation and increase their transparency. The applicant also encouraged public participation by scheduling public meetings and publishing meeting minutes online. The information regarding the fish species covered by the plan is the last major piece of the HCP still missing. The consulting firm hired to assist in the development of the HCP has finalized a new tool for watershed management, the Ecosystem Diagnosis and Treatment system (EDT), to model the impacts to and conservation measures for the fish. The firm's development of the tool and their desire to ensure rigor has been the cause of the most recent delay.³⁹ Wilson (2014) expects an

³⁹ The applicant and consulting firm assembled a panel of independent scientists to provide recommendations for the model.

administrative draft will be complete by the summer of 2014 followed by an expected two years for NEPA and CEQA⁴⁰ review.

The Bay Delta Conservation Plan (BDCP) is the most complex and ambitious of the plans under development. The goal of the plan is to secure an adequate water supply while restoring the Sacramento-San Joaquin Delta. The Delta has long been a source of water conflict in California, with aquatic species experiencing declines in numbers so dramatic that federal courts required nearly a one-third reduction in water withdrawals from the two largest water delivery systems in the state (serving approximately 25 million customers) in 2007. Californians' reliance on the Delta for water is matched by the Delta's reliance on Californians to manage their water and land responsibly, as nearly half of California's land surface drains into the Delta. The BDCP was formally conceptualized in 2005 with a Statement of Principles, a precursor to a Memorandum of Understanding ("Statement of Principles," December 20, 2005). It is being offered as a multi-stakeholder solution⁴¹ to prevent the ecological collapse of the Delta while ensuring water withdrawals in the future.

The BDCP includes 22 conservation and restoration measures and will require massive alterations of the state's water infrastructure to create more natural flow patterns and to protect against infrastructure failure due to earthquakes, sea level rise, and other natural disasters. The plan as proposed would cover 11 fish, five mammal, 11 bird, two reptile, two amphibian, seven invertebrate, and 18 plant species for a total of 56 covered species. After nine years of research, scientific analysis, negotiations, policy review, and public input, the 9,000 page Draft BDCP and

⁴⁰ The California Environmental Quality Act is a state law applied to all discretionary projects proposed to be conducted or approved by a California public agency, including private projects requiring discretionary government approval. Any HCPs in the state of California must complete a CEQA review in addition to the federal NEPA review.

⁴¹ The Steering Committee includes representatives from five state and federal agencies, seven potential regulated entities, six environmental organizations, four local agencies, and *ex officio* representatives from the Delta Stewardship Council and three fishery agencies.

25,000 page EIS were published in the Federal Register in December 2013. The implementation of the plan is estimated to cost about \$25 billion in capital and operational costs throughout the 50 year permit. The funding will be provided by state and federal water contractors, state funds, and federal grants (Plan & Committee, 2010, p. 8.66).

As is the case with many large HCPs, the BDCP has been met with mixed reception. The organizations associated with the development of the plan and Governor Jerry Brown are strong supporters while environmental groups are the driving force behind the opposition. Opponents claim that the plan has been rushed and that the creators did not fully consider the best available science (Obegi, 2013). Some opponents have even gone so far as to propose an alternative plan, focused on developing a number of smaller and cheaper projects that would work synergistically ("Bay Delta Conservation Plan Conceptual Alternative," 2013). The public comment period for the Draft BDCP and associated Draft EIS closes in June of 2014. A plan of this magnitude will be the first of its kind and, if implemented, will likely have a tremendous impact on the popularity of HCPs in the future depending on its success.

The Mendocino Redwood HCP has a single applicant, the Mendocino Redwood Company (MRC). The plan will cover nine fish and wildlife species or sub-species and 31 plant species in the proposed estimated plan area of 213,244 acres (HCP pg. 1.5). The MRC has gone to great lengths to include the public's input during the planning process. The company held three public scoping meetings when the HCP process began in 2002 and two additional meetings in 2006 to update the public on the plan's process. The applicant's goal for the plan is to offset silvicultural activities such as commercial harvesting and timber operations through conservation measures, which have been proposed in four categories: measures for aquatic habitat, measures for terrestrial habitat, measures for fish and wildlife, and measures for rare plants. The applicant

has further strengthened the HCP and embraced outside participation through a Memorandum of Understanding with the North Coast Regional Water Quality Control Board to meet water quality objectives and a Long Term Streambed Agreement which will create a programmatic approach to permitting streambed crossings in the area. The draft of the HCP and associated documents were published to the Federal Register in November of 2012 (77 FR 70145); MRC is currently incorporating recommendations into their final HCP.

Consideration of the Washington Department of Natural Resources Aquatic Lands HCP (WDRHCP) began in 2002, when DNR created a team of staff to define the department's role under the ESA in ensuring their actions would not harm endangered species. The team recommended developing an HCP that would cover all 2.6 million acres of state-held aquatic lands and provide the Washington DNR with an ITP to cover all DNR-authorized activities. Development of the plan began in 2003, with the Washington Department of Natural Resources (DNR) as the sole applicant. Once completed, the plan is proposed to cover 29 at-risk species from impacts resulting from overwater structures such as boats, log booms, and shellfish aquaculture. After 11 years of research and analysis, GIS data mapping, public participation and scoping, negotiations between conflicting interests, and multiple rounds of informal review, the draft HCP and accompanying documents are scheduled to be published to the Federal Register in 2014. The Alameda HCP and the WDRHCP illustrate two different causes of delay in HCP processing: the Alameda plan has been delayed due to the applicant's indecision while the WDRHCP (which has been complete for over two years) has been delayed by the Service's slow production of an EIS (Higgs, 2014).⁴²

⁴² The fifth plan under development is discussed in detail as a case study, below.

Case Studies

Cedar River Watershed HCP

Background

The Cedar River Watershed HCP (CRWHCP) is an example of an archetypal aquatic habitat conservation plan – it has a single applicant (the City of Seattle), includes management and preservation activities, and implementation is funded by the applicant. The CRWHCP was designed to allow the applicant to continue using the watershed to provide water supply and electricity; the plan covers both terrestrial and aquatic species. In 1993, King and Snohomish Counties, WA, received about two-thirds of their drinking water and the City of Seattle received about one percent of their electricity from the Cedar River Watershed, a known habitat for the Chinook salmon (*Oncorhynchus tshawytscha*). As it became evident that the Chinook salmon would be listed under the (ESA), the City of Seattle began the development of the Cedar River Watershed HCP.⁴³ The HCP was a collaborative effort between the City of Seattle, the USFWS, NMFS, the Washington State Department of Ecology, the Washington State Department of Fish and Wildlife and the USACE (the “Collaborators”), although the City of Seattle is the sole ITP holder. The development process included over 100 meetings, field trips, presentation and workshops for the public, making it a highly interactive HCP.

The Cedar River Watershed HCP covers 83 species with two levels of intensity. Six species of federally protected birds, six species of federally protected fishes, and two species of federally protected mammals are considered the “Species of Greater Concern” and are defined as those species whose current population status indicates that immediate measures need to be taken

⁴³ By initiating plan development before the species was listed, the City took a preemptive measure to avoid potential regulatory problems.

in order to halt or reverse serious regional population decline. The remaining 69 species covered by the plan are considered “Other Species of Concern” and may be at risk for listing in the future. The plan includes species-specific management terms for the 14 Species of Greater Concern, while the remaining species are protected indirectly through habitat preservation. The plan area covers 90,545 acres of the Cedar River Watershed⁴⁴ and the water supply and hydroelectric operations within the area, including Lake Washington. The HCP is designed to address issues related to the ongoing water supply, hydroelectric power supply and watershed management activities. As such, the plan does not address issues related to urbanization or development of private lands within the watershed.

The time between the conception of the plan and the issuance of the related ITP was approximately seven years (See Appendix A). The applicant spent the bulk of the time (about five years) analyzing studies ranging back as far as a decade, negotiating terms between the Collaborators, and drafting the HCP. Although the City solicited help from a consulting firm for public outreach and the formatting of the HCP, City staff conducted the research and analysis, headed the negotiations required to ensure the cooperation necessary for the protection of the those covered species, and wrote the majority of the 1034 page HCP (Holtz, April 9, 2014). Despite being the sole ITP holder, the City of Seattle was joined by the Collaborators in signing an Implementation Agreement (IA).

Implementation Agreements are not always necessary in the production of HCPs, but are helpful in a variety of situations. In the Cedar River Watershed, the USACE is responsible for water levels at Lake Washington, navigational traffic between Lake Washington and Puget

⁴⁴ This area represents the upper two-thirds of the Cedar River Watershed and will be hereby referred to as the Municipal Watershed. The remaining one-third of the watershed is managed through the Lower Cedar River Basin Plan, a local agreement between King County, the City of Seattle, the City of Renton, and the Muckleshoot Indian Tribal resource managers.

Sound,⁴⁵ and the Lake Washington Ship Canal; these operations have a direct effect on some of the species covered in the CRWHCP. To reconcile these competing interests, the USACE entered into two agreements that are complimentary to, but independent of, the HCP - the Instream Flow Agreement and the Landsburg Mitigation Agreement. These agreements assure that all signatories will be responsible for instream flow and fish passage requirements to the satisfaction of the ESA and are solidified within the IA. Because federal agencies are not allowed to be ITP holders, agreements such as these are a way to assure their compliance with HCP protocol. Although the Muckleshoot Indian Tribe participated in the development of the HCP, it chose not to be an active signatory to the IA.

The USFWS opted to conduct an Environmental Assessment (EA) for the Cedar HCP rather than the more extensive Environmental Impact Statement (EIS) to fulfill NEPA requirements. They based this decision on the net effect of the relatively small impacts from the covered activities despite its spatially large plan area. The Notice of Availability for the Draft HCP along with the Draft EA and associated documents were published in the Federal Register in December of 1998, opening up a 60 day period for public comments. Due to a high level of public interest in the project, the public comment period was extended for 20 additional days, providing a total of 80 days for public comment. Public outreach during this time included four public workshops attended by a total of over 1,000 people and two SEPA hearings; “hundreds” of written comments were received (CRWHCP, ch.1.1.3). The City of Seattle made changes to the HCP in response to concerns raised by the public and by the Muckleshoot Indian Tribe during the comment period. The ITP was issued in April of 2000.

⁴⁵ Puget Sound is an inlet of the Pacific Ocean, into which the Cedar River drains. It is a complex estuarine system of interconnected marine waterways and basins, with one major and one minor connection to the Strait of Juan de Fuca and the open Pacific Ocean.

Covered Activities

There are four covered activities in the CRWHCP: (i) Operations and management of the City's water system (not including impacts of private water management activities); (ii) watershed and forest management activities; (iii) educational activities; and (iv) activities related to the implementation of the HCP. City water supply management activities include all drinking water supplies and hydroelectric power operations including discharge and storage within City-owned dams and reservoirs and intake for the City's hydroelectric power plant. Covered forest and watershed management activities include those practices which are described in Washington State laws (RCW 76.09; WAS 222-08) and include timber harvest, thinning, reforestation, and mechanical brush control; repair, engineering, decommissioning and maintenance of forest roads, including the use of gravel pits and the maintenance and replacements of culverts and bridges; and the sale of forest materials. Educational activities covered under the HCP include public tours and field trip programs within the watershed and the construction of educational and cultural facilities; science conducted in the watershed, both for the HCP and by outside scientists; public recreation programs; and other educational and recreational activities that do not increase levels of take from those allowed in the ITP. HCP implementation takes place downstream of Landsburg Dam and consists of any mitigation, conservation, research, and monitoring activities outlined within the HCP.

Covered Aquatic Species

The four aquatic species covered in the plan include two resident fishes (the pygmy whitefish and bull trout) and four anadromous fish species (Chinook, Coho, and sockeye salmon and steelhead trout). The bull trout (*Salvelinus confluentus*) was listed as threatened under the ESA in 1999 (CRWHCP, 4.2-92). The Cedar River Municipal Watershed supports a single

reproductively isolated population of bull trout in Chester Morse Lake and its tributaries. The health of the stock is uncertain, although a study completed in 1998 concludes that “there are no data suggesting a chronically low condition” (WSFW 1998, as cited in CRWHCP 4.2-92). The pygmy whitefish (*Prosopium coulteri*), a major prey source for the bull trout, was listed as a Washington State sensitive species in 1998. There are nine known populations within the entire state, all of which are vulnerable to extinction due to low recruitment rates from stream fragmentation. A single, relatively large population is found in Chester Morse Lake. The Puget Sound Chinook salmon was listed as threatened under the ESA in 1999. The construction of the Landsburg dam has created a barrier to fish migration and contributed to the continued decline of the Chinook salmon. The Coho salmon (*Oncorhynchus kisutch*) from Puget Sound and the Strait of Georgia form a coherent genetic cluster and are relatively stable, making them a unique population. Despite their stability, they are considered candidate species for listing by NMFS because of their uniqueness. There are four populations of sockeye salmon (*Oncorhynchus nerka*) within Puget Sound, one of which is found within the Cedar River and is classified as depressed. Although there are 60 known stocks of wild steelhead trout (*Oncorhynchus mykiss*) within Puget Sound, the only significant natural production within the larger Lake Washington Basin comes from a single population within the Cedar River. The bald eagle (*Haliaeetus leucocephalus*) and the common loon (*Gavia immer*) are ornithological species of greatest concern which rely heavily on the aquatic and riparian ecosystems.

Minimization and Mitigation Measures

The HCP was designed to resolve ongoing issues within the watershed including the blockage of fish passage posed by the Landsburg Diversion Dam, ambiguity regarding roles of the USACE concerning water supplied to Lake Washington that is used to operate the Ballard

Locks for navigation and fish passage, and the development of a technically sound instream flow plan that will protect anadromous salmonids. The goal of addressing these problems was to provide certainty for the City's utility operations while providing a net benefit to the species affected by these activities. Radical alteration of the hydrologic system, passage barriers, and fragmentation from the construction of dams and culverts were contributing to the steady decline of the species at the time of the plan development. The applicant devised four main categories of conservation strategies to combat these issues: watershed management mitigation and conservation, minimizing and mitigating the effects of the anadromous fish migration barrier at the Landsburg Diversion Dam, instream flow management, and monitoring and research. The inclusion of all four categories represents an ecosystem approach because it protects late successional and old-growth forests for headwater and riparian zones, in addition to direct stream measures, providing overall protection of aquatic and terrestrial species and habitats.

i. Community Based Watershed and Forest Management

The bulk of the conservation strategies utilized by the Cedar HCP are those that collectively contribute to the protection and restoration of the covered species and their habitat through minimizing the impacts of City operations, preserving habitat elements that are of high value, and restoring the quality and functionality of degraded habitats. The watershed management, mitigation, and conservation strategies are intended to provide comprehensive, long-term protection for the watershed ecosystem (including stream, riparian, and upland habitat protection), the removal of a large part of the existing road structure, and the implementation of guidelines for watershed operations designed as best management practices for the protection of the covered species. Altogether, these actions will create an ecological reserve within the Municipal Watershed. Establishing a reserve on this particular piece of land is significant due to

its proximity to a well-protected old-growth and late successional forested corridor to the north of the watershed, its important link from the Puget Sound lowlands to the Cascade Mountains, its relative high stream health, its large blocks of intact old-growth forest, and its major water contribution to Lake Washington and to the riverine habitat of anadromous fish.

The prohibition on harvesting any timber from the watershed forest for commercial purposes created the reserve. The reserve is actively managed through planting, thinning, and other silvicultural practices aimed at rapidly increasing the value of the protected habitat. Only non-commercial harvesting deemed necessary for habitat restoration or matters of human safety is allowed. Research and monitoring measures are in place to track the success of both the reserve and the management techniques by which it is maintained. The reserve was designed to protect all aquatic habitats in the watershed, consistent with operation of the water supply; improve aquatic and riparian habitats and water quality through restoration projects; sustain natural processes and functions that create and maintain habitats and restore those processes that have been disturbed by past human activities; and provide landscape connectivity within stream systems and among significant wetlands and associated riparian zones. Forested riparian zones created within the reserve are intended to prevent spikes in water temperature outside of the species' tolerances, provide erosion control, prevent sedimentation and/or nutrient loading, stabilize hydrology by decreasing stormwater runoff, and improve habitat by increasing naturally occurring large woody debris in the stream.

At the time of the development of the HCP, there were 620 miles of roads in the watershed, 520 of which were relatively intact (CRWHCP, 4.2-50). The HCP outlines guidelines and cost estimates for road removal, road improvements and repairs, new road construction, and road maintenance. An interdisciplinary team prioritized and scheduled the removal of

unnecessary roads and authorized the reconstruction of those roads deemed necessary. The goal of the road management portion of the plan is to reduce the road network to only those roads absolutely necessary for the management of the watershed. This reduction in roads will minimize sediment delivery; improve altered hydrologic patterns; and reestablish fish passage, where feasible, between upstream and downstream habitats. The entirety of the road construction program will reduce the net active road miles in the watershed by approximately 236 miles over the first 20 years of the HCP, and was estimated to cost approximately \$12,250,000 (CRWHCP, 4.2-55).

Although some streambank erosion is natural and necessary for downstream habitat, excessive streambank erosion caused by human interference to the system can degrade aquatic habitats. The CWRHCP's goal is to minimize excessive rates of streambank erosion caused by roads and land management. Project areas will be prioritized, similarly to the roads, based on the presence of channel migration zones, potential benefits from minimizing erosion, ability to successfully reduce erosion, and ease of access for construction and maintenance. Bio-stability and conventional methods will be used, based on site specific requirements. Conventional methods include placement of large rocks to prevent erosion along the banks while bio-stability methods use a combination of organic matter (logs, live plants, etc.) and erosion control fabrics. The total cost for streambank stabilization was estimated at \$756,000.

Before the HPC was implemented, about 84% of the forest in the watershed had been logged (CRWHCP, 4.2-35). Many of these areas were not replanted after the harvest of mature timber, allowing pioneer plants to grow in their place. These plants shade the seedlings of previously dominant trees, changing the abundance and composition of tree species. This alteration in tree composition is significant in riparian zones as riparian vegetation helps stabilize

streambanks; provides large woody debris (LWD) that influences sediment movement, channel complexity, and nutrient cycling; influences nutrient input, assimilation, and transformation; and shades stream water thereby influencing water temperatures (CRWHCP, 4.2-58). In order to restore the ecosystem complexity, the City will conduct silvicultural activities to reestablish appropriate stand conditions. These activities can include planting native plants, removing invasive and exotic plants, and thinning dense stands. Conifer under-planting, thinning of dense riparian stands younger than 30 years old to accelerate growth, and the placement of LWD are specific measures that the City is conducting under the CWRHCP. Restoration of aquatic and riparian ecosystems costs were estimated at approximately \$1,579,000. These costs include a LWD program specifically designed for the mainstem Cedar River, between the Cedar Falls Powerhouse and the Landsburg Diversion Dam.⁴⁶

ii. Species Specific

The remaining management terms are habitat-specific and species-specific restoration programs. Many species need a variety of habitat types in order to meet biological requirements for food, sheltering, and reproduction over their life cycle. Areas protected uniquely for a specific habitat type are titled Special Habitats in the HCP and include unique habitats embedded within the forested landscape. Special Habitats include talus and felsenmeer slopes; all rock formations,⁴⁷ natural upland grass-forb meadows and persistent shrub communities. These habitats represent a minor portion of the overall reserve (approximately 2,000 acres that do not overlap spatially), but are crucial to a number of covered species (CRWHCP, 4.2-70). These habitats are subject to unique regulations in that all operations beyond restoration planting and

⁴⁶ This program prevents the over-accumulation of LWD at intakes, which could pose a security threat to the city drinking water or to navigation vessels. Under the HCP, more LWD will be allowed to remain in-stream at these junctions, under the condition that personal safety and drinking water integrity are not compromised.

⁴⁷ Which include non-vegetated talus and felsenmeer, rock outcrops, cliffs, and landslides.

ecological thinning are prohibited within 200 ft of the designated habitat. Species-specific management terms are included for the 14 species of greatest concern. The strategies for anadromous fish species are composed of elements of the Anadromous Fish Conservation Strategy, the Instream Flow Conservation Strategy, and the Monitoring and Research Program related to instream flows and fish mitigation, in addition to the applicable, previously mentioned community-based forest and watershed management protocols (CRWHCP, 4.2-96).

iii. Anadromous Fish Conservation Strategy

The Anadromous Fish Conservation Strategy (AFCS) and the Instream Flow Strategy are the results of the two supplemental agreements included under the IA. The AFCS includes the operation and associated activities⁴⁸ of sockeye salmon hatcheries near Landsburg Dam; the construction and associated activities of fish passage and protection facilities at Landsburg Dam and Chester Morse Lake; and the Chinook, Coho, and steelhead mitigation program. The AFCS requires four facilities to be created for the safe upstream and downstream passage of the Chinook and Coho salmon and steelhead trout through a fish ladder at Landsburg Dam, a fish ladder and holding and sorting facilities at the partial migration barrier created by the City's water supply line, downstream fish passage facilities at Landsburg, and new screening facilities for water supply intake (CRWHCP, 4.3-6). The completion of AFCS facilities will provide 17 miles of protected refuge habitat. Emergency supplementation for population support of Chinook and Coho salmon and steelhead trout may be used in the interim period during fish passage construction if the Collaborators agree that intervention will not significantly risk naturally occurring populations. Sockeye salmon will not be permitted to pass through Landsburg Dam, as their unique life history pattern results in large spawning populations, which could pose a threat to the quality of the drinking water supply. To mitigate for that take, the City of Seattle provides

⁴⁸ These activities can include construction, maintenance, operation, improvement, modification, and/or dismantling.

funding for the operation and support of the Cedar River Sockeye Hatchery. Sockeye fry from the hatchery are introduced into wild populations during returns to the Cedar River in order to supplement fisheries in downstream Lake Washington. The hatchery has the potential to produce up to 34 million sockeye fry from approximately 4,000 adults.

iv. Instream Flow Strategy

The Instream Flow Strategy was the product of 11 years of cooperative studies, negotiations and modeling based on studies by the Collaborators (CRWHCP, 4.2-99). Instream flows are a major factor in determining the habitat quality of the four covered anadromous fishes, multiple of which occur simultaneously during any given season within the watershed. The Flow Strategy is designed to supply the flows needed for all life stages of the covered species, taking into account the different flow needs based on season and species and selecting the species and life stage that should receive primary emphasis for each season (CRWHCP, 4.2-99). The Instream Flow Strategy (IFS) and the Cedar River Instream Flow Oversight Commission (the Commission) were formally created through the Instream Flow Agreement (IFA), signed by NMFS, USFWS, WDFW, WDOE, and the City of Seattle (CRWHCP, 4.4-2-3).⁴⁹ The overall goal of the program is to implement a beneficial instream flow regime for the aquatic covered species while maintaining the supply capacity from the municipal water system in a way that offers future flexibility as more information becomes available or needs change. The HCP guarantees minimum flows schedules designed to mimic the natural hydrograph of the Cedar River watershed, which are measured in real time through a series of water gauges and managed accordingly. The Commission can require supplemental flows above the minimum requirement when warranted by the biological needs of the fish. The HCP provides for added flexibility by reserving 100 million gallons/day over the guaranteed flow regime for instream resources if

⁴⁹ The Commission includes members of all the signatories of the IFA plus the Muckleshoot Indian Tribe

needed. Lastly, the IFS includes prescribed downramping⁵⁰ in order to avoid the stranding of juvenile fish. All of these measures are subject to change as data are collected from the research and monitoring programs.

Research & Monitoring

The research and monitoring programs for the HCP are tailored to the individual elements of the plan (watershed terrestrial, watershed aquatic, anadromous fish, instream flow, reservoir management). Major activities related to the HCP aquatic monitoring and research program include the installation and operation of gauges or other measuring devices related to monitoring of instream flows, water quality, or aquatic habitats and direct population sampling. The information gleaned from monitoring and research will be the primary means of assessing the success of the HCP and for triggering adaptive management protocols. At the time of HCP implementation, all specific methods and sampling protocols were not yet in place; years 1-3 were designated for the completion of a full-scale implementation plan; however, the plan specified that the research protocol would revolve around an ecosystem-level approach to data integration.

Measures which could provide new data capable of triggering adaptive management include: (i) the study of accretion flows downstream of Landsburg, with the possibility of adjusting instream flows; (ii) drinking water quality monitoring related to passage of Chinook and Coho salmon over the Landsburg water intake, with the potential need to restrict the number of individuals passed above the intake; (iii) studies related to the operation of the sockeye hatchery with the potential to adjust management for the protection of wild fish. The final research and monitoring plan will include the general monitoring, reporting, and administrative protocols; specific threshold criteria for triggering additional or altered mitigation; limits of the

⁵⁰ Prescribed downramping limits the rate at which the instream flow can be reduced.

commitment to adaptive management mitigation; and protocols for resolving disputes over the interpretation of results.

Changed Circumstances & Adaptive Management

The city includes six environmental events in their adaptive management protocol: windstorms, forest fires, insect or disease outbreaks, droughts, floods, and landslides. These events are only covered, however, under specific conditions. Forest fires trigger adaptive management response if the fire removes between 300 and 2,000 acres of forest cover; smaller fires will not cause enough damage to be of concern while larger fires would be considered unforeseen circumstances. If a triggering fire takes place, the permittee will be responsible for (i) stabilizing slopes for the reduction of sedimentation and erosion through reseeded, reforestation, and streambank stabilization as needed; (ii) consulting with the Services to create a salvage logging plan as appropriate; and (iii) making adjustments to forest restoration activities in order to accelerate restoration of impacted areas. Windstorms resulting in the blowdown of 200-500 ft. of riparian forest along a fish-bearing stream or any event along any stream from which sedimentation damage could adversely affect covered species downstream are considered changed circumstances. Adaptive management measures to address this event include (i) reduction of sedimentation via slope stabilization, reprioritizing funds if needed; (ii) restoration of riparian forest; and (iii) reconsideration and adjustment of restoration activities as needed to minimize further impacts to the streams or to accelerate restoration of the forest in the impacted areas.

Disease and pest infestations defoliating between 300 and 2,000 acres are considered changed circumstances. If these conditions are met, adaptive management protocols will include (i) measures to protect water quality from sedimentation, (ii) measures to remove fuel wood to

prevent forest fires, and (iii) measures to restore the forests to prevent fragmentation. Additional adjustments in forest restoration activities will be considered in the most heavily impacted areas. Flood events which are likely to cause significant long-term alteration in stream habitat within 10-25% of the total reach of a fish-bearing stream or floods within the capacity for control by the reservoir facilities are considered changed circumstances. Contingency plans for such events include (i) measures to stabilize material added to stream and (ii) “best efforts” by the permittee to reduce damage to fish habitat downstream in the event of a flood with potential consequences downstream from the reservoir.

Landslide events which are shallow and rapid that cause, or are likely to cause, significant long-term damage to stream habitat conditions in 10-25% of the length of a fish-bearing stream are considered changed circumstances. Adaptive management protocol for such events includes (i) minimization of sedimentation and (ii) reprioritizing funds for road maintenance and improvement as needed. Droughts resulting in hydrological conditions equal to the low stream flows of the worst 10% of years for the 64.5 year period of record for the Cedar River are considered changed circumstances. The contingency plan for such events includes (i) the implementation of the stream flow management protocol (switching to critical flows) and the Instream Flow Agreement (a plan to reduce drinking water demand and use), and (ii) implement a passage assistance plan for the bull trout when drawdown is significant enough to jeopardize trout movement upstream for spawning during a significant portion of the season. The remaining adaptive management measures are left undefined, but will be based on the results from the research and monitoring program (CRWHCP, 4.5-75).

Unforeseen Circumstances

The CRWHCP includes climate change; earthquakes; significant natural or human-caused events (not caused by the City) which have taken place outside of the Municipal Watershed, but affect species within the watershed who spend some of their lives outside of the watershed; and severe windstorms, forest fires, insect or disease outbreaks, droughts, floods, and landslides as unforeseen circumstances. Climate change is included due to the lack of scientific consensus surrounding the “changes in disturbance regimes” as a result of climate change (CRWHCP, 4.5-63). Because of the applicant’s inability to estimate the potential frequency, severity and damage from these events, it cannot assure specific adaptive management responses. Instead, the City intends to “take whatever actions that it deems necessary and appropriate to protect water quality, infrastructure, and the environment” in the case of such an incident. Although the Services may require a change in the HCP if one of these unforeseen circumstances occurs, the change may not require the “commitment of additional land, water or financial compensation or additional restrictions on the use of land, water or other natural resources otherwise available... to the permittee” (50 CFR § 17.3).

Funding and Implementation

The total funding commitment from the City for the Cedar River Watershed HCP is estimated at \$78,871,016 over a 50-year period. The costs are delineated across cost categories and years of implementation, with the first ten years considered individually and the remaining 40 years divided into five and ten year clusters. If you remove the exorbitantly large cost of the construction and operation of the sockeye hatchery from the costs of the Landsburg mitigation (approx. \$14 million of \$34 million), watershed management becomes the largest sub-cost

(approximately \$24 million) of the HCP. These costs stem from road removal and improvements, streamside restoration, and upland restoration.

Discussion

The Cedar River Watershed HCP contains both proactive and reactive elements. While I consider the Cedar River Watershed HCP an administratively proactive HCP because the development of the plan preceded the official listing of the Chinook salmon, the management terms consist mostly of projects that require the improvement of highly degraded habitats. This is a common issue facing aquatic HCPs, with 17 of the 25 implemented aquatic HCPs reviewed in this study requiring retroactive habitat restoration. The HCP also includes the measure of species augmentation to mitigate for the Landsburg Dam. The dam is crucial for the storage of drinking water for the City, but was built without consideration for fish passage, an issue that is being addressed through hatchery augmentation and the construction of a fish ladder and sorting facility. The remaining elements of the plan, the reserve creation and the instream flow strategy, provide a strong foundation for the protection of the covered species.

Watershed rehabilitation is the most costly aspect of the plan. Habitat restoration was required due to logging of over 84% of the forested watershed and the construction of impassable dams with relatively lax erosion and conservation measures in place. Although some of the restoration measures could have been avoided through more responsible land management over time, some issues lie outside the City's reasonable responsibility, such as the construction of the Landsburg Dam, which was completed before the passage of the ESA. Meanwhile, other measures would be needed regardless of water and land management activities due to an increasing population's water supply needs. This is an example of when an aquatic HCP is

necessary to balance the sustenance needs of human and aquatic populations, a dilemma that strictly terrestrial plans do not have to face.

The City of Seattle was fortunate to own the majority of the watershed, allowing them to design the plan around their own goals and objectives. The City was still required to coordinate with a few additional state and federal agencies due to the presence of dams within the watershed, but it did not have to consider the needs and desires of private landowners within the plan area. A potential result of this freedom was the slightly disappointing adaptive management program. It is not nearly as extensive as I expected from such a long and complex plan. The specific parameters under which an environmental event must occur leave little doubt about when adaptive management will be needed, but the required reactions to those events are described in vague language. Additionally, the absence of a well-defined research and monitoring program was startling to me. These weaknesses would not be acceptable for plans with multiple applicants, as negotiations over elements as important as adaptive management and research and monitoring protocols should not be taking place after the ITP has been issued.

It is likely that this strategy of delaying the production of these protocols was taken in order to expedite the processing of the plan. The ITP could be issued given a framework for developing better protocols, and stringent development of those protocols could take place during the first years of plan implementation. In this case, it appears that the flexibility was used well – since the implementation of the plan there have been 39 peer-reviewed articles that have influenced the adaptive management of the plan ("Peer-Reviewed Publications Associated with HCP," 2014). It is disconcerting, however, that the earliest of these articles was published in 2006, six years after the ITP was issued, and that a key aspect of monitoring, the riparian sampling protocol, was not completed until 2005. Despite these concerns, the 2013 Compliance

Report (the designated form of verifying HCP progress) states that the City has maintained or exceeded compliance under the HCP and that they have implemented emergency measures as necessary to ensure said compliance. The permit duration of 50 years may also be a factor in the delayed production of adaptive management – it provides a long window of time for adaptive measures to be implemented. On the other hand, the long permit duration without a fully developed research and monitoring plan and adaptive management provision could have been disastrous had the permittee and/or FWS office been lax in the subsequent production of those sections. The inclusion of such vague and incomplete language was a risk, but in this case, it seems to have paid off. It allowed the permittee to begin plan implementation as soon as possible and quality monitoring measures have since been established

(http://www.seattle.gov/util/EnvironmentConservation/OurWatersheds/Habitat_Conservation_Plan/AbouttheHCP/ReportsPlans/index.htm). I would not, however, suggest this method of implementation in a Region with less vigilant enforcement of the ESA by the Services,

The Edwards Aquifer HCP

Background

The Edwards Aquifer Habitat Conservation Plan (EAHCP) is a multi-jurisdictional, multi-species plan. It covers three endangered aquatic vertebrate species, three endangered aquatic invertebrate species, one endangered plant, and one threatened aquatic vertebrate. These eight species are found in the Edwards Aquifer, the San Marcos Springs, and the Comal Springs ecosystems. The largest threat to their survival is the intermittent loss of habitat from reduced springflows caused by the natural fluctuation in rainfall, discharges at other springs, and regional pumping of the Aquifer. The issuance of the ITP in 2013 triggered the implementation of Phase 1 of the HCP – the habitat minimization and mitigation measures, springflow protection

measures, and the adaptive management program to monitor the effectiveness of the measures and guide future management decisions. Phase 2 of the EAHCP includes additional measures of springflow management for the biological requirements of the covered species to be implemented as needed. The HCP has multiple permit holders: the Edwards Aquifer Authority (EAA), the City of San Antonio (acting through its San Antonio Water System), the City of San Marcos, City of New Braunfels, and Texas State University (TSU) (EAHCP, 1.1). The permit duration is 15 years, a relatively short duration due to the uncertainty surrounding future water demands.

The Edwards Aquifer spans 180 miles across central Texas, providing drinking water for over two million people in addition to providing for agricultural, industrial, domestic, and recreational needs in the region (EAHCP, 1.1.2). Its importance to both human and aquatic species is due to the fact that it sources the two largest springs in the region – the San Marcos and the Comal, both of which feed tributaries to the Guadalupe River. In 1991 the Sierra Club filed a lawsuit under the ESA alleging take of the protected species from over-pumping the Aquifer and failing to maintain minimum flows during periods of drought. This lawsuit resulted in the courts compelling the State of Texas to address the problem. The Texas Legislature created the Edwards Aquifer Authority (EAA) under the EAA Act (Act of May 30, 1993, 73rd Leg., R.S., ch. 626, 1993 Tex. Gen. Laws 2350, as amended) and directed the EAA to develop a means to ensure minimum continuous springflow such that the requirements of the ESA were met; a means of regulating pumping from the aquifer; and a means for implementing management restrictions during periods of critical drought (EAHCP, 1.1.3). In 2000, a Notice of Intent to Produce an EIS for an Edwards Aquifer HCP was posted to the Federal Register (65 FR 8188), informing the public of the USFWS's intent to begin gathering the information necessary

for such an endeavor. This was a proactive move on the part of the USFWS; however, no further development was made by the EAA. When a plan for long-term management of the species had yet to be begun by 2006, the USFWS invited stakeholders in the region to join a collaborative process to develop a comprehensive plan. Thirty-nine individuals, entities, and groups executed a Memorandum of Agreement⁵¹ with the USFWS to become parties of the Edwards Aquifer Recovery Implementation Program (EARIP) (EAHCP, 1.7.1).

Following the creation of EARIP, the Texas Legislature established the Edwards Aquifer Recovery Implementation Steering Committee (Steering Committee). The Steering Committee was required by law to include individuals from the EAA, Texas Water Development Board, Texas Commission on Environmental Quality, Texas Department of Agriculture, San Antonio Water System, Guadalupe-Blanco River Authority, San Antonio River Authority, South Central Texas Water Advisory Committee, Bexar County, CPS Energy, Bexar Metropolitan Water District and Texas Parks and Wildlife Department. In addition, it was required to include nine individuals to represent retail, industry, public utility, agricultural permit holders by region, environmental, and recreation interests. Lastly, the bill required the production of a “program document that may be in the form of a habitat conservation plan used in the issuance of an incidental take permit” through a cooperative and consensus-based process to ensure the protection of federally listed species (EAA Act § 1.26A(d)). The EARIP stakeholders recommended the development of an HCP to the EAA.

The Steering Committee was responsible for the hiring of a program director, appointing leaders of the subcommittees, establishing and publishing a meeting schedule, and making final decisions on the HCP. There were four subcommittees established to aid in the analysis of the

⁵¹ A Memorandum of Agreement is a legal document describing the terms and details of a cooperative agreement between two or more parties working together on a project or to meet a common objective.

raw data. The Science Subcommittee was made up of experts on the Edwards Aquifer and was required to make recommendations on the potential for the creation of a separate San Marcos Pool, and to evaluate how that would affect existing pools; the necessity of maintaining minimum springflows for the covered species; and the trigger levels for the San Marcos Springs flow for the San Antonio Pool.⁵² It was also tasked with analyzing the discharge rates and aquifer levels needed for each covered species (EAHCP, 1.7.1.2). An independent panel of scientists from the Sustainable Ecosystem Institute peer-reviewed all of the information created in the science subcommittee.

The Recharge Feasibility Subcommittee was responsible for assessing the need for recharge facilities and formulating plans that would allow for the operation of such facilities, calculating the amount of water which should be made available from a recharge project, maximizing federal funding for the project, and evaluating the financing of the project including management fees (EAHCP, 1.7.1.3). The Public Outreach Subcommittee educated the public, public officials, and the media about EARIP activities; disseminated press releases and reports; and was required to reflect the interest of the EARIP as a whole rather than representing individual stakeholders (EAHCP, 1.7.1.4). The Ecosystem Restoration Subcommittee assessed the need for, and developed options for, the implementation of the restoration work across the region, including opportunities for coordination with entities outside of the EARIP (EAHCP, 1.7.1.5). Seventeen temporary working groups were established throughout the project for short-term, single task projects (EAHCP, 1.7.1.6). The applicants employed RECON Environmental, Inc. (with offices in San Diego and Santa Maria, California and Tucson, Arizona) to compile the

⁵² Pools are discrete areas of high capacity within the aquifer that have limited connectivity due to areas of low permeability.

final document and solicited recommendations from three additional consulting firms during the construction of the document (EAHCP, 1.7.2).

In March of 2010, the Notice of Intent for Public Scoping and the Production of an EIS was published in the Federal Register (75 FR 10305). Seven public meetings were held in April of 2010 (EAHCP, 1.7.3). The Draft EIS and HCP were made available in July of 2012 (77 FR 42756). A second public comment period took place following the release of the drafts and the Notice of Availability of the Final EIS was published to the Federal Register in February of 2013 (78 FR 11218). The ITP was issued on March 18, 2013, making this the longest development of a plan for aquatic species protection in the study, whether considered from the passage of the EAA Act in 1993 or from the original Federal Register notice in 2000.

Unique Regulatory Inputs

i. Texas Water Law

Texas water law is unique and the rules vary between groundwater and surface water. Surface water is governed through an adaptation of the “prior-appropriation” doctrine while the groundwater is governed by the “rule of capture” doctrine (EAHCP, 1.5.1). The prior appropriations adaption holds that the State of Texas has ultimate ownership of all water in streams and lakes within the state and grants individuals permission to use state water based on seniority of permit requests. On the other hand, any landowner may drill a well on his or her land in order to pump groundwater. As long as the landowner puts that water to beneficial use, they may pump without limitation of amount, place, or purpose – a common law that disregards any negative impacts of pumping on fellow groundwater users or springflows.⁵³ This law still remains in effect in much of Texas, although the creation of groundwater districts has begun to be a means of regulating the operation of groundwater pumping within their respective

⁵³ A common law is a law derived from judicial precedents and come practices rather than statutes.

boundaries. The first groundwater district was established in 1951; as of 2011, 97 groundwater districts had been established within the state. In the plan area for the EAHCP, the groundwater common law has been superseded by the EAA Act, allowing groundwater to be regulated by statute rather than the rule of capture (EAHCP, 1.5.1).

ii. Edwards Aquifer Act

The primary purpose of the EAA Act is to give regulatory rights to the EAA for Aquifer withdrawals through its Groundwater Withdrawal Permit Program. The program includes five basic elements: identification of persons qualified for water rights in the Aquifer, issuance and administration of withdrawal permits, capping the aggregated number of permits which may be issued, creating a venue for permits to be marketed, and reducing withdrawals during critical periods for the benefit of the covered species (EAHCP, 1.5.2).

Covered Activities

There are four categories of covered activities for incidental take included in the EAHCP: (i) regulation and use of the Aquifer; recreation (and other) activities in, and related to, the (ii) Comal and (iii) San Marcos spring ecosystem; and (iv) activities involved in and related to the implementation of the HCP measures (EAHCP, 2.1). Each applicant sought individual incidental take permits within these activities. The Texas Parks and Wildlife Department's only covered activity was the implementation of measures included in the HCP.

i. Edwards Aquifer Authority

The EAA Act created three categories of groundwater rights in the plan area: interim, permits, and exempt wells. The interim authorizations were used in 1996 to ease the transition from common law to the permit system; these rights were superseded once the final applications for permits had been received and rights were lost to those who had not submitted a permitting

application. Regular permits are those given to landowners subject to an annual cap created by the Texas Legislature. The permit term is a maximum of ten years, although the permits can be interrupted subject to Aquifer levels. Renewable 30-day emergency permits are available to avoid loss of life or to prevent severe threats to public health or safety. These are rare permits and had only been issued once at the time of the development of the HCP. Recharge recovery permits are issued only for the Aquifer Recharge, Storage, and Recovery Program, discussed later. These permits are not subject to the annual withdrawal cap which restricts Regular Permits. Exempt wells do not require a permit to be pumped and are those which cannot produce more than 25,000 gallons of water per day, are used solely for livestock or domestic use, and are not located within a platted subdivision. Additionally, a well is exempt if it is operated by a federal facility. These wells are not subject to the annual withdrawal cap, although they are required to be registered with the EAA in order to guarantee exempt qualification. All permitting activities, including those not discussed here, and minimization and mitigation activities are included in the EAA's allowed incidental take under the EAHCP (EAHCP, 2.2).

ii. Cities of New Braunfels and San Marcos

Although the cities of New Braunfels and San Marcos did not apply for identical take permits, they requested similar activities be covered in their permits and so are discussed here as one applicant. The cities' covered activities include recreation, specific surface water diversions, infrastructure maintenance and repair, and the implementation of the HCP within their jurisdictions. The cities have the authority to manage the ecosystems within their geographical boundaries. These systems are heavily relied upon for recreational activities. Recreational activities include, but are not limited to, swimming, wading, tubing, boating, canoeing, kayaking, scuba diving, and fishing, in addition to the operation of specific wading pools (free of motorized

vessels), public access points, and outfitting services. Covered diversions include, but are not limited to, diversions for water level management, golf course maintenance, and spring-fed pool operations (EAHCP, 2.3&2.4).

iii. Texas State University

Texas State University's covered activities include specific educational, research, recreational, and public services activities on portions of the San Marcos River and San Marcos Spring; the permitted use of the Aquifer; diversion of water from the spring; use of the San Marcos River and Spring; and the implementation of the HCP within their jurisdiction (EAHCP, 2.5).

iv. San Antonio Water System (SAWS)

The San Antonio Water System is the applicant representing the interests of the City of San Antonio. It is the water purveyor to the City and to parts of surrounding counties. Covered activities for SAWS include pumping from the Aquifer which has been authorized by the EAA and pumping for the purpose of Aquifer Storage and Recovery (ASR) (EAHCP, 2.6).

Covered Species

There are eight aquatic species covered within the EAHCP. The Comal Springs dryopid beetle (*Strygoparthus comalensis*), the Comal Springs riffle beetle (*Heterelmis comalensis*), and the Peck's cave amphipod (*Stygobromus pecki*) are the three endangered invertebrates covered by the plan. The Comal Spring riffle beetle is a flightless, one-eighth inch long aquatic beetle found in the flowing, uncontaminated waters of the spring runs (EAHCP, 3.5.2). The dryopid beetle is a translucent, subterranean beetle, restricted to the headwaters of the springs. These beetles breathe through a gas exchange within a small bubble retained by hydrophobic hairs on their underside; with lower flows, this method of respiration is ineffective (EAHCP, 3.5.3).

Peck's Cave amphipod is also subterranean, but is located within the aquifer itself. It is a potential food source for the covered salamanders (EAHCP, 3.5.4). The fountain darter (*Etheostoma fonticola*), San Marcos gambusia (*Gambusia georgei*), and Texas blind salamander (*Eurycea rathbuni*) are the three endangered vertebrates. The fountain darter is a small, green fish with dark markings that is endemic to the Comal and San Marcos rivers. The darters require clear, clean flowing, and thermally constant waters with undisturbed sand and gravel substrates, rock outcrops, and areas of submergent vegetation to survive (EAHCP, 3.5.1).

The Texas blind salamander is an unpigmented, cave-adapted species with a large head and reduced eyes, reaching a maximum length about 4.7 inches. The salamanders require thermally constant temperatures, and tend to live along the submerged ledges of the Aquifer. It is considered the most advanced species of cave-dwelling salamander, displaying many unique adaptations. It will likely be of considerable value in determining water quality changes within the Aquifer (EAHCP, 3.5.6). The San Marcos salamander (*Eurycea nana*) is a small, light brown, lungless salamander with large eyes and external gills. These salamanders require clean, clear, flowing water with areas of sand, gravel, large rock, and vegetative cover (EAHCP, 3.5.5). The San Marcos gambusia (*Gambusia georgei*) has a very small range size and is thought to be extinct, as it has not been found during sampling since 1983; it is included in the covered species as a precautionary measure. These small fish need quiet, shallow, thermally constant, open water adjacent to moving waters with muddy substrates in order to survive (EAHCP, 3.5.8). Nonnative aquatic plants have been found in abundance at some localities, which may have been the cause of the gambusia's disappearance. Texas wild rice (*Zizania texana*), also covered by the HCP, is a partially submerged aquatic perennial grass endemic to the San Marcos River. It requires swift moving, shallow, clear waters for survival (EAHCP, 3.5.7). There were three additional species

within the plan area appropriate for listing, but they were not included formally in the HCP due to their similar locations, habitat requirements, and morphology as the covered species.

Minimization, Mitigation, and Recovery Measures

The EAHCP was designed to be implemented in two phases. The first phase consists of habitat minimization and mitigation measures, measures to maintain continuous springflow during drought conditions, and measures to contribute to the recovery of the species. These began implementation immediately after the ITP was issued. The second phase consists of flow protection measures that may or may not be necessary based on the response of the system to Phase 1. Each applicant's responsibilities are unique to their jurisdiction and the species' needs within them.

i. Phase I

Flow Protection Measures. There are four main sections to the flow protection strategy: (1) emergency stage V critical period management reductions, (2) SAWS ASR trade off, (3) the Regional Water Conservation Program, and (4) the Voluntary Irrigation Suspension Program Option (EAHCP, 5). The flow protection measures are the most critical of the minimization and mitigation measures, given that the area has been experiencing record-level droughts within the last decade and climate change models forecast similar, long-term drying conditions in south-central Texas (EAHCP, 3.1.3.9)

a. Stage V Emergency Withdrawal Reductions

Water flows within the Plan Area are monitored by the EAA through the Critical Period Management Program. The program tracks instream and spring flows using a variable index. Under the HCP, the EAA will amend the program to include Stage V – a state of emergency due to drought – which will result in mandatory water withdrawal reductions of 44 percent in the

Uvalde and San Antonio pools. If Stage V conditions occur, all outdoor use of groundwater would be prohibited with limited exceptions. In the case that a municipality is unable to meet public health and safety needs with the 44 percent reduction, they will not be denied pumping rights, but they will receive substantial fines and penalties as the EAA sees fit. Leasing of water from alternate sources or from permit holders able to meet stricter reductions is allowed under these conditions, and would likely be a cheaper alternative to incurring fines.

b. San Antonio Water System Aquifer Storage and Recovery Program

Established by the EAA, but with leasing rights given to SAWS, this program is designed to assist in maintaining protective levels of springflow during drought years, while meeting the demands of SAWS ratepayers. The program is available to all permit holders, with the goal of acquiring 50,000 acre feet of water per year from EAA-issued Regular Permits. The water will be used in three tiers. Two-thirds of the water in the program will be under a lease option, exercised by the EAA. Second and third tier options will be called on only when ten-year recharge reaches certain levels. When those leases are in place, the water will be either pumped into the ARS project or will remain in the Aquifer, unpumped. The final one-third of leases will be pumped into the ARS facility immediately, where the water will be used to fill, idle, and maintain a portion of the SAWS ARS facility. The water remains in storage unless drought-of-record conditions are met, in which case the water will be used to augment springflows. The springflows will be evaluated on a monthly basis until the drought levels have subsided. Seven, ten, and 15-year lease periods would be made available, with an increasing price per acre foot per year with the length of the lease (EAHCP, 3).

c. Regional Water Conservation Program

While there have been isolated, community-based conservation programs initiated within the plan area, there has not been a regional project to consolidate these efforts. The goal of this program is to conserve a total of 20,000 acre feet per year of permitted or exempt water withdrawals through a regional effort. The program guarantees that one-half of the conserved water will remain in the Aquifer, unpumped and still owned by the participating permit holders. The EAA provides technical assistance and incentives to these participants in exchange for their conserved water. The unpumped water will be available to permit holders after 15 years. For the 15 years in which it remains in the Aquifer, it will contribute to stabilizing springflows. To ensure that the program's benefit is "reasonably certain to be realized," SAWS and other municipalities will commit to reducing their pumping during the permit period (EAHCP, 5.6).

The Regional Water Conservation Program is administered by the EAA, but will likely be implemented by local water purveyors, or alternative governing entities in rural areas with no water purveyors, in order to reach a larger target of municipal water users and owners of domestic wells. A Monitoring Committee will be established by the EAA, consisting of a representative from each of the applicants and members of participating water purveyors. This committee will provide technical support and expertise, seek additional funding sources for the program, and create guidelines for improving the efficiency of the program. The focus of program implementation will revolve around reducing water lost through leaks, installing high efficiency plumbing, and implementing large scale commercial/industrial retrofit rebates and water reclamation for reuse efforts (EAHCP, 5.1.3).

d. Voluntary Irrigation Suspension Program Option (VISPO)

VISPO is a voluntary program that permit-holding irrigators within the plan area can participate in. It offers them compensation for foregoing their allotted water withdrawals during times of low springflows. The program focuses on irrigators because they account for a significant portion of annual pumping, with most of that pumping concentrated in months when drought conditions are worse. Participants can enroll any amount of their permit or the entirety of the permit, although full relinquishing of rights is not expected. The total volume goal for enrollment in the program is 40,000 acre feet per year from permit holders across six counties. The program will be triggered if flows are below an established rate on the annual trigger date of October 1, a date chosen to provide irrigators and businesses ample time to make arrangements for the season. If triggered, the program will result in the complete suspension of enrolled permits for the following calendar year.

Participants in the program are given the option to enroll for five years or ten years. Each plan has a standby fee paid per acre foot to the enrollee regardless of the Aquifer's condition. The standby rate is higher for the ten year plan and increases even further through years 6-10 to encourage participation.⁵⁴ In the event that Aquifer levels drop below the trigger index, there is a higher fee paid to the enrollee which also increases for each year the permit is suspended.⁵⁵ Based on meetings with irrigators and letter inquiries, the EARIP is confident that there is enough interest in the program to procure the 40,000 acre feet goal within the 15 year permit period. VISPO is administered by the EAA (EAHCP, 5.1.2).

⁵⁴ The five year program's standby fee is \$50/af while the ten year program offers a \$57.50/af fee, which increases to \$70.20/af after the 5th year.

⁵⁵ In the case that the permit is suspended, the five year plan participants will receive \$150/af with a 1.5% increase and the ten year participants will receive \$172.50/af for years 1-5 and \$210.60/af for years 6-10.

Habitat Protection Measures. Similarities between the sites within the plan area led to similarities among the habitat measures, however, there are unique characteristics within each site that mandate customized measures of protection.

a. Comal Springs

There are 11 unique measures designed to protect the Comal Spring ecosystem. This is the largest spring system in Texas, consisting of four major spring runs which meet at Landa Lake, making up the headwaters of the Comal River. The City of New Braunfels is the primary applicant responsible for these protection measures, as the spring falls within its jurisdiction. The system has excellent water quality and nearly constant temperatures, but is very susceptible to drought and to the increasing development in the area. The City is committing to restoration and direct habitat modification measures in order to improve the degraded habitat and aid in the recovery of the covered species (EAHCP, 5.2).

New Braunfels will physically modify some of its infrastructure through channel restoration and flow split management in order to improve habitat. The Old Channel Environmental Restoration and Protection Area will undergo channel modification to enhance fountain darter habitat. Sediment will be removed and a flow monitoring station will be installed. The flow-split management program is designed to complement the restoration of the Old Channel by manipulating the valves and culverts in the channels, allowing high flows to be divided between channels, and maintaining stable hydrologic conditions for the covered species. Existing gates will be replaced or repaired to prevent sustained high flows and the resulting scouring of native vegetation. When low-flows are present, the split will be shifted to the Old Channel, providing protection for the maximum amount of fountain darter habitat (EAHCP, 5.2.1).

Six measures are focused on restoring the natural habitat of the covered species (EAHCP, 5.2.2). Riparian zones and aquatic habitats will be managed for native species through replanting, sediment removal, and removal of non-native species. Additionally, the city will create new aquatic habitat through the planting of native plants for food and sheltering in currently unoccupied, but otherwise suitable habitat. The depth, velocity, and substrate present are all conditions which will be considered for the production of new habitat, and these conditions will be monitored and managed adaptively. The city will conduct non-native animal control measures on an annual basis; the suckermouth catfish, tilapia, and ramshorn snail specifically pose either the greatest threat of competition to the darters or contribute to degrading habitat modification. The physical removal of litter and debris which has collected in the Comal River will prevent the shading out of native vegetation and maintain the health of the stream. This will take place on a routine basis and after flooding events. In the case of low-flows, the city will remove dead, decaying vegetation in order to prevent decreases in dissolved oxygen levels. The city is also considering the aeration of Lake Landa as a potential alternative method of maintaining dissolved oxygen.

Other measures implemented by the city will include a gill parasite control initiative, a household hazardous waste program, and a golf course management plan. The presence of an Asian trematode, a parasite which attaches to and damages the gills of a fish, has been found within the Comal Springs ecosystem. A common, non-native snail in the system is an intermediate host, allowing the parasite to mature and become a threat to fountain darters; the city will fund a program to remove the snail and monitor the impacts on the fountain darter (EAHCP, 5.2.6). The household hazardous waste program is intended to prevent the increasing development in the area from impacting the high water quality of the Comal River. The program

will accept and properly dispose of hazardous waste, including prescription drugs and Freon, four times per year (EAHCP, 5.2.7). The golf course management plan is designed to reduce the impacts of the Landa Park Golf Course which is adjacent to the fountain darter habitat of the Old Channel. Historically, the golf course has received its water directly from the Old Channel. The new management plan will allow the golf course to pump some surface water, but only as a supplement to the water reuse system which the city and TSU will help design and implement (EAHCP, 5.2.11).

b. San Marcos Springs

San Marcos Springs is the second largest spring ecosystem in Texas, but is more stable than the Comal; it has never stopped flowing in recorded history, although its flows have decreased substantially during droughts of record. The stability of the flows supports the covered species found in the San Marcos River and Spring Lake.⁵⁶ The system maintains a nearly constant temperature and chemistry year round. The greatest threats to the San Marcos River system are urban development and recreation. The City of San Marcos and TSU share responsibility for the implementation of the HCP measures designed for the system, many of which provide opportunities for field work conducted by TSU students.

There are 16 measures within the EAHCP designed to protect the San Marcos system, seven of which are similar to those discussed under the Comal Springs section. The six habitat restoration measures and the household hazardous waste program found in the Comal section are included in the San Marcos system with only slight variations, so they will not be discussed here (EAHCP, 5.3). The remaining nine measures consist of species-specific habitat measures, recreation measures, and measures designed to maintain water quality. There are two site-specific measures within the San Marcos Spring section. The Texas wild-rice enhancement and

⁵⁶ Spring Lake located within the headwaters of the San Marcos River.

restoration project is a joint effort between San Marcos and TSU. The project will remove non-native vegetation from wild-rice stands, in addition to creating buffer zones around occupied stands. TSU will replant wild-rice in areas with suitable habitat after non-native vegetation has been removed; all stands will be monitored and their management altered based on results (EAHCP, 5.3.1). The second site-specific measure is the removal of the Sessom Creek sand bar; the sand bar has expanded so far that it has constricted the river channel and covered a stand of wild-rice. TSU will conduct a study to determine the safest procedure to remove the sand bar and will be responsible for implementing the procedure, but the City must approve the plan before implementation (EAHCP, 5.4.6).

The City will identify permanent recreation access points and manage for high traffic areas within the system to minimize and mitigate recreation effects; boating and diving regulations in Spring Lake will also be implemented. The designation of access points will condense the foot traffic of recreational users such as swimmers and tubers, allowing the City to focus on those areas for bank stabilization activities. These areas will be strategically chosen based on their ease of access and distance from sensitive habitats. Darters will be removed from the area during construction of access points and bank stabilization; the city will plant native aquatic vegetation between access points to discourage guests from using alternate entrances to and exits from the river (EAHCP, 5.3.8). Additionally, the city will establish permanently protected exclusion zones where recreation is prohibited during low flow conditions. These zones will not cross the entire river channel, allowing longitudinal recreation to continue (EAHCP, 5.3.2.1). TSU conducts SCUBA and diving courses within Spring Lake; a small, heavily disturbed area that is unsuitable habitat has been designated for these activities. Additionally, motorized vessels are prohibited. TSU will also work with the golf course to

develop a management plan that will incorporate best management practices to decrease use of chemicals and improve water quality.

The City will implement three programs in order to protect the high level of water quality. They will require all septic systems to be registered, evaluated, and permitted to prevent nutrient loading from leaking or otherwise malfunctioning; they will implement a hazardous waste program identical to that of New Braunfels; and they will construct two sediment ponds to collect contaminated runoff from rain events. These ponds will be located along the river and will contribute to a decrease in hydrologic alteration following rain events. The ponds will be operated based on their location and the individual requirements of those locations. Size and depth of the ponds will be determined based on stormwater runoff measures in the area. The City will drain the water from the ponds for treatment; dredged sediment from the ponds will be taken to the City's compost site.

Supporting Measures. The following are supporting measures that contribute to the success of the Edwards Aquifer HPC, however, they are not the primary focus of the plan.

a. Fish Hatcheries

There are three hatcheries working with the EAA for the production of off-site refugia to be used in the event that a wild population is extirpated. The EAA is responsible for funding the efforts to house and protect these populations in addition to research of their biology, life histories, and methods for reintroduction (EAHCP, 5.1.1)

b. Low Impact Development and Best Management Practices

Contaminants in the river systems, especially during times of low-flow, are a serious threat to the covered species. New Braunfels and San Marcos will both establish criteria to reduce the impacts of impervious surfaces. Although the program has not yet been designed or

implemented, it will likely include incentives for low impact development projects. Additionally, the EAA has banned the use of tar coal pavement sealants within the recharge zone of the Aquifer and in defined portions of the Contributing Zone to the Aquifer. The reason for this ban was not explicitly discussed in the HCP; it is likely related to studies that have found tar coal sealants to leach polycyclic aromatic hydrocarbons, compounds which have been found to negatively impact the growth, development, and survival of aquatic species (Bryer, Elliott, & Willingham, 2006; Scoggins, McClintock, Gosselink, & Bryer, 2007).

c. Other Measures

Remaining measures included in the HCP consist of a ban on the transport of hazardous waste across the San Marcos and Comal Rivers; water quality monitoring; and ecological and biological modeling.

ii. Phase II

Phase I makes up the bulk of the HCP, with Phase II providing additional support on an as-needed basis. Phase II is a formal adaptive management program that will be implemented no later than December 31, 2017 and will be designed around the compiled biological and ecological research from Phase I. Phase II will consist of new management terms if they are deemed necessary and continued research and monitoring, including species sampling, flow measurements, water quality measurements, population mapping, and surveys for non-native species. Phase II will also implement the species augmentation measures which were under research at the supplemental hatcheries during Phase I if deemed necessary. Phase II provides adaptive management objectives, triggering conditions, ERPAs, and off-site refugia options for each of the covered species (EAHCP, 6.3).

Unforeseen Circumstances

Unforeseen circumstances considered in the EAHCP include any events not specified within the changed circumstances portion of the plan. Natural disasters such as fires, hurricanes, tornados, severe wind or water erosion, earth quakes and landslides are all considered unforeseen circumstances. Floods with a streamflow peak greater than 31,300 cfs and droughts worse than the drought of record are also considered unforeseen circumstances, although such events of a lesser magnitude are covered under “changed circumstances” discussed below. In the case that an environmental disaster occurs, the applicants may perform an expedited adaptive management plan (AMP) analysis of the affected area and/or covered species and implement any conservation measures which may mitigate the damage so long as they do not exceed their allotted funds or adversely affect other covered species in the process. This response would fulfill their obligation under the HCP (EAHCP, 8.2).

Changed Circumstances and Adaptive Management

The EAHCP outlines 12 specific changed circumstances, the conditions which must be met for the adaptive management measures to be triggered, and the adaptive management protocols to be implemented in such a case. The changed circumstances are primarily related to failings in management protocols, such as inadequate permitting, or manmade problems, such as pollution and invasive species, rather than natural events. In some instances there are multiple potential adaptive management protocols, the implementation of which is established by the severity, location and type of trigger experienced (EAHCP, 8.1).

Many of these changed circumstances will be immediately obvious, such as the EAA issuing term permits that cause the amount of pumping from year to year to exceed the maximum modeled pumping allowed by the HCP. Others, such as degraded water quality due to recreation,

will require active research and monitoring for detection. In the former case, the EAA will be aware of the situation prior to permit issuance and will consult with the AMP to determine what modifications will be required in order to ensure that allowed impacts will not be exceeded. In the latter case, the applicants will be aware of the changed circumstance only after the water quality monitoring results have shown that HCP parameters have been exceeded. From there they will determine the specific location and scope of the impairment, adjust one or more Phase I conservation measures, and continue to monitor the area for improvement or further impairment. The cumulative results of research and monitoring throughout Phase I will establish new measures and criteria for Phase II.

Funding and Implementation

i. Phase I

Phase I implementation was designed to begin immediately following the issuance of the ITP, and to continue for seven years. The expected costs of Phase I are estimated at \$130,445,929 for the first seven years and \$75,838,026 for the remaining seven years, with the highest costs coming from the flow management programs and measures (approximately \$90 million and \$41 million). Habitat restoration measures for Comal and San Marcos Springs are relatively equal (\$9 and \$8 million, respectively) with costs dropping substantially after years one and two (EAHCP, 7.1.1). These measures will be paid for through non-recurring funds, as they are a one-time cost. The costs for restoration in Phase I will be higher, as the bulk of habitat restoration measures and channel modifications are scheduled to take place within the first seven years of implementation. Following the completion of those tasks, the annual costs are expected to remain relatively uniform, covering only scheduled maintenance and monitoring; the only change will come from the potential need to implement AMP measures (EAHCP, 7.1.1).

Funding contributions will come from two main sources: aquifer management fees (AMFs) and third party contributions. The EAA is authorized (via the EAA Act) to charge AMFs to individuals with withdrawal permits in order to finance its programs and administration. The EAA will assess a separate AMF for the implementation of the HCP called the “Programmatic Aquifer Management Fee.” This fee will fully fund the implementation of both Phases of the HCP. Third party contributions are sums forwarded to the EAA by entities which do not pump directly from the Aquifer, but which will benefit from the plan due to their location downstream. The following entities have signed a voluntary, but legally binding, Joint Funding Agreement to help fund the HCP: the City of Victoria, the Guadalupe-Blanco River Authority, City Public Service Energy of the City of San Antonio, the San Antonio River Authority, Union Carbide Corporation, and the Guadalupe Basin Coalition. Together, they have committed to contributing at least \$735,000 annually towards HCP implementation, with the Guadalupe-Blanco River Authority and Union Carbide Corporation contributing the bulk at \$400,000 and \$200,000, respectively. The third party contributions will be used to pay costs beyond the previously mentioned estimated \$130 million. All funds will be placed into an operations account, the interest of which will be used to supplement the cost of the VISPO and SAWS ARS projects (EAHCP, 7.1.2).

ii. Phase II

Phase II costs consist only of costs associated with the expansion of the SAWS ARS program due to the increased uncertainty associated with flow objectives and water availability in the future. Approximately \$55.5 million was included in the costs for ASR during years eight through fifteen; these are the funds that will be used in case expansion of ASR is needed. Any funds needed beyond those set aside would constitute a changed circumstance and would require

alterations be made within the funding allocation; thus, the currently discussed amount is the maximum obligation for funding of Phase II of the HCP (EAHCP, 7.2). Applicants are free to pursue additional funding sources to augment Phase I or contribute to further implementation of Phase II.

Discussion

The Edwards Aquifer HCP has only been in effect for a short period of time, as the ITP was only issued in December 2013; however, the permittees have already begun implementation with VISPO enrollment opening for 2015 and the Texas Legislature passing the ban on tar coal sealants within specific zones of the plan area. The EARIP has been recognized for their work as well, receiving the Department of Interior's Partners in Conservation Award, which is given to those who have achieved outstanding conservation through the engagement and contribution of a variety of partners and stakeholders. While it is too early to analyze the success of the HCP, the development process as well as other elements of the plan can be used as models for those who are considering a regional aquatic HCP in the future.

There were a number of variables influencing the success in development and adoption of the Edwards Aquifer HCP: a court ruling that demanded the protection of the species, the threat of additional litigation after the State failed to produce an HCP, and a dire drought taking place during the planning process which highlighted the severe need for such a plan. These three factors played a large role in securing the support of the Texas Legislature and giving the EAA and the EARIP the authority they needed to create such a powerful HCP. The pressure created by these factors led to the strict timetable for the completion of the HCP, a timetable that was made possible partially due to the fact that the USFWS began researching the situation in 2000 after the EAA Act made it clear that a plan would be needed.

The consensus-based approach used to develop the plan, whereby representatives from every stakeholder group served on the steering committee, also contributed to the success of the plan. When a water resource is going to be impacted by a project, the effects of such a project are felt by many users, including those far downstream. This HCP does not only address all of the immediate users within the plan area (recreationalists, municipalities, irrigators), but includes those who will benefit downstream by incorporating them into the third party funding mechanism. The third party fees are a creative way of capturing the positive externalities of the project in the cost, but would not have been likely to succeed had the third parties not been included in the steering committee and the planning of the project.

The plan takes adaptive management one step further than any other plan in my study by establishing it directly as a phase. The uncertainty that comes with water scarcity and an increasing population makes it highly likely that this HCP or any aquatic HCP addressing such conditions will work perfectly as written. The applicants do not underestimate that uncertainty and make funding provisions to specifically address future failures in the plan; most plans do not include such provisions in their planning and rely on reallocation of funds to implement adaptive management as needed. The uncertainty of future water supplies is further accounted for by the relatively short permit duration. While many aquatic HCPs have permits running 30 or 50 years, the EAHCP permit is only issued for 15 years which will allow for major alterations pursuant to permit renewal if needed.

The Cedar River and Edwards Aquifer HCPs provide a very different approach to the development and implementation of aquatic HCPs, but both represent well-designed plans. They both include a high level of coordination with interested parties. Even though the Cedar River HCP was implemented by a single landowner, the city worked collectively with federal agencies

and environmentalists with interest in the watershed and has created a comprehensive and easily navigated website to host all of the documents related to the plan so that the public can stay informed on their progress. Both cover a large portion of their watershed and take into account the effects their HCP will have outside of the plan area.

The flexibility of the HCP process to work for different needs is seen clearly through these two plans. The superior construction of Phase II and the adaptive management program into the final Edwards Aquifer HCP, highlights how vague and underdeveloped the adaptive management program of the Cedar River HCP was when the ITP was issued. However, as previously discussed, the scheme chosen by each was appropriate to meet the priorities of each plan. The implementation of the Edwards Aquifer plan relied on cooperation and coordination amongst a number of applicants; there would be no time to negotiate additional protocols or fund redistribution following implementation. The single applicant and history of strict enforcement in Region 1, however, made it appropriate for the city of Seattle to finalize its adaptive management, research and monitoring protocols subsequent to plan implementation.

Cumberland HCP

The Cumberland HCP is a plan at the crossroads; it had a difficult start and has faced considerable opposition due to the conservative nature of the residents in the area, but it has persevered and is near completion as of 2014. The production of the Cumberland HCP has been the collaborative effort of the Cities of Crossville and Wartburg; Cumberland, Morgan, and Scott Counties; The University of Tennessee (UT); Tennessee Tech University; The Nature Conservancy (TNC); local organizations, business owners, and landowners; and private citizens. As developed, the plan covers 23 species, nine of which are aquatic. The covered activities of the plan are residential, commercial, industrial, public facilities, recreational, and institutional

development in addition to waterbody crossings (roads, bridges, culverts, water and sewage underground lines). As of April of 2014, these are the only officially defined components of the HCP; other components are still in revision and negotiation between the applicants and USFWS.

The plan began in unusual circumstances in 2004 when the Tennessee Wildlife Resources Agency (TWRA) was searching for a way to protect the vast natural resources found within Tennessee while still encouraging economic growth and development. The agency received a grant from the USFWS to create two HCPs for the area – one to address forestry practices and one to address water resource management. The TWRA remained the official entity in charge under the forestry HCP and contracted TNC to oversee the water resources plan; together they pitched the idea to the local governments.⁵⁷ This method was highly unusual and put the advocates of the HCP at a disadvantage early on, as they were in the position of “selling” the project to the local governments (who are the applicants) rather than the governments requesting help and championing the HCP themselves (Teresa Payne, 2014). However, the idea was embraced by two cities and three counties and the original collaborators laid the groundwork for the production of the HCPs. The simultaneous development of two HCPs in the same area proved to be impossible, and the TWRA forestry plan moved ahead quickly while the Cumberland HCP stalled for a few years. Very little progress was made until 2008, when the development of the HCP was reinvigorated (Teresa Payne, 2014).

The Cumberland HCP was initially conceived as the Water Resources HCP and the cities of Crossville and Wartburg along with Cumberland, Morgan, and Scott Counties were the tentative applicants. The management of the HCP was divided among a number of groups and committees: the science committee, the core team, the steering committee, the outreach

⁵⁷ Additionally, TNC contracted out much of the scientific and outreach work to Tennessee Tech and the University of Tennessee. Tech has completed its commitment to the project, while UT still works on HCP development and outreach efforts.

committee, and subcommittees within the county commissions for the participating applicants. The science committee⁵⁸ has primarily completed their role in the planning process; the data have been collected and many of the students whose research contributed to the project have graduated. Despite the cessation of regular meetings, the science committee is still available for consultation as needed (Teresa Payne, 2014). The core team (i.e. project managers), outreach team, steering committee, and county commission subcommittees are the current active players. The core team is responsible for drafting the sections of the HCP while the outreach team is responsible for updating the public on the progress of the HCP and communicating between the applicants, TNC, and the USFWS. The steering committee is responsible for making final decisions regarding the measures included in the HCP.

While other HCPs discussed previously have been required by law (such as the Edwards Aquifer HCP) or initiated by the applicant (such as the Cedar River HCP), the Cumberland HCP was ‘pitched’ to its applicants by outside sources. This beginning made the colleges and core team the perceived advocates of the HCP and they fell into that role, being the ones constantly pushing the development of the plan forward during the early years of development (Teresa Payne, 2014). With the initial delay due to the forestry HCP and the perceived outside leadership, Morgan and Scott Counties and the city of Wartburg grew less interested in remaining active in the HCP, although they were still participants until 2011. In 2011, a risk analysis projected through 2030 indicated that those geographic areas were less likely to impact the habitat of the covered species, so Morgan and Scott Counties and Wartburg removed themselves as official applicants for the HCP. Despite leaving the HCP in an official capacity, the counties and city will still accept recommendations from the core team within the HCP

⁵⁸ The committee consists of students and faculty from the contracted institutions, experts on the species, and independent scientists.

project as appropriate (*Final Cedar River Watershed Habitat Conservation Plan*, 2000; Teresa Payne, 2011).

As the HCP gained momentum, the collaborators worked to establish trust with the residents of the plan area; TNC's leadership in the plan development and the increasing presence of the USFWS in the area did not make the plan popular initially.⁵⁹ The collaborators began publishing a regular electronic newsletter in 2008 in an effort to gain more public support, encourage public participation, and educate the citizens on the facts of the plan. These newsletters provide not only updates on the progress of the HCP, but also information on related topics such as the treatment of Crossville's wastewater and the dangers of sedimentations (Girhring, 2009; Woodle, 2009). They also publicize the date and location of upcoming meetings and events and include blurbs on a "featured species" to be covered in the HCP. By providing these educational tidbits, the applicants are allowing the public to learn about the issues at hand and come to their own conclusions in regards to the need for an HCP, rather than being told directly how to think about the issue.

The newsletter was a critical step in gaining public acceptance of the HCP, but more was needed given the political climate of the county. The project developers (TNC and the educational institutions) began distancing themselves as the face of the plan and encouraged the public officials in Cumberland County to "really own" the plan and fight for its success (Teresa Payne, 2014). The mayor of Crossville has enthusiastically stepped into the role of champion for the plan and two other members of the city council recently voted to extend the contract for the

⁵⁹ Cumberland County is a very conservative county on the subject of private property rights and the actions of the federal government. The county is one of the few in the country to not have any zoning ordinances. It has been a common practice in Cumberland County, as in many conservative rural areas, to undertake development without consideration of the ESA. This was especially true for Cumberland County since there was very little information regarding the range of the covered species until data gathering for the HCP began. It is possible that the HCP will be blamed for increased enforcement of the ESA now that the Services are privy to said information. Opposing the HCP for this reason is counterproductive, however, since enforcement of the ESA will now increase in the area regardless of the HCP's status; the HCP will streamline the increased enforcement rather than create a larger burden.

development of the HCP for an additional year (Young, 2014). This vote comes at a critical time as mayoral elections will be held in November and it is uncertain if the current mayor will be re-elected. His opponent is not a supporter of the HCP and could tip the opposition into the majority on the city council.⁶⁰ In light of this political crossroad, public support is more important than ever for the success of the HCP. The applicants and their public outreach team are continuing to court support by maintaining a heavy presence at local events such as the Cumberland County Fair.

Although much of the plan remains in development, many factors already have been established. The plan will primarily cover commercial and residential development, making it a unique plan for aquatic species. The plan is entirely voluntary; developers can choose to participate in the plan or they can create their own plan if a listed species is found on their property. Both terrestrial and aquatic species are covered in the plan. Conservation measures are still being decided, with some under review by the USFWS, and some still in negotiations between parties, but they will include a combination of minimization and mitigation measures including land acquisition. Conservation measures under consideration for aquatic species include stream barrier prevention and removal, erosion control for new construction, and the establishment of aquatic buffers. The negotiations of the conservation measures have been time consuming; all parties involved want a plan that truly balances the needs of the species with the needs of the community. The collaborators will decide on a funding mechanism in the final stages of HCP development due to the uncertainty in costs and in developers' willingness to pay. Due to the high costs associated with land acquisition and the contentious fiscal and political climate in the area, the collaborators are likely to hire a financial advisor with past HCP experience to develop this portion of the plan. This will increase the chances of establishing a

⁶⁰ As it stands now, there are three supporters of the HCP and two opponents of the HCP on the city council.

highly effective funding scheme while imparting a higher level of credibility to those who may have reservations about the HCP.

The example of the Cumberland HCP along with the subsequent discussion of the Etowah HCP in Chapter 3 provides excellent insight into the world of conservation in conservative areas. Navigating deeply held political values that are at direct odds with the concept of an HCP is a challenge that many HCP developers are unfamiliar with. Negotiations for HCPs are rarely easy; however, the majority of historical conflicts regarding plans and court cases brought against HCPs are rooted in the desire to make HCPs stronger and more conservation oriented, not to prevent the plans from being created. In the case of the Cumberland HCP, conflict is present on both sides: from those who are concerned about private property rights and the participation of TNC, and from environmental groups who are concerned that the plan will not provide the protections necessary for the persistence of the species. The bridging of these two ideals has been a long and arduous process for the HCP developers. The tension remains; however, a recent article in the Crossville Chronicle suggests that the citizens of Crossville are willing and interested in understanding the plan (Mullinix, 2014).

Conclusion

The plans which are currently under development taken together with the most recently implemented plan, the Edwards Aquifer HCP, suggest that there are two prominent trends emerging in aquatic HCPs: spatially large and multi-species plans. The tendency towards this type of plan is intuitive – they have fewer processing requirements than multiple smaller-scoped plans, the inclusion of multiple species provides the applicant with protections in the case of future listings, and the large geographic scale can allow for an ecosystem conservation approach. These benefits make this approach especially appealing for applicants who are facing

dire environmental conditions such as the severe drought affecting both Texas (the Edwards Aquifer HCP) and California (the Bay Delta Conservation Plan). The danger, however, is that plans covering multiple species have been shown to result in poorer species protections due to overstretched resources (Langpap & Kerkvliet, 2012). The Edwards Aquifer HCP was largely able to address that concern through the utilization of over ten years of research and a short permit duration. The dire situation in the Delta certainly necessitates swift action, but only so much that the scientific integrity of the plan is not compromised. This balancing of swift action and effective conservation is a challenge that future aquatic HCPs developers are going to have to address as populations continue to grow and drought conditions continue to occur more frequently.

Traditionally, trends in applicant type have been less clear. The majority of applicants are private landowners (Figure 2.1), however, government applicants (combined state and local) have only two fewer implemented plans than private companies. There is only a single plan that is implemented by a nonprofit organization and that organization was created specifically to design and implement the plan. There are only three multi-applicant aquatic plans which are currently implemented, however, all of the plans were permitted between 2005 and 2013. Additionally, the development of the multi-applicant Cumberland, Bay Delta, and Etowah HCPs suggest that multi-applicant plans are quickly increasing in popularity. This is unsurprising, given the trend towards larger plans.

Beyond the inclination towards large, multi-species, multi-applicant plans, there is a developing trend in the location of plans. Although the majority of plans continue to take place in Regions 1, 8, and 2, recent plans have been approved in Region 3 and there is the Cumberland HCP being developed in Region 4 (Figure 2.1). This is significant due to the differences in

enforcement between the Regions. HCPs tend to be expensive, especially those requiring land acquisition and/or land restoration. Their popularity in Regions 1 and 8 are not surprising, given those Regions' historical support for conservation in addition to the strict enforcement of the ESA by the Services. The popularity of HCPs in Region 2 is surprising, however, because of the strongly held opinions on private property rights and the relatively weak concern for conservation. It is unlikely that the large scale Edwards Aquifer HCP would have been completed without the court compelling the state to address the issue of take; however, the consensus-based, collaborative approach suggests that the political entities saw past the hammer of the ESA and embraced the HCP approach as a desirable solution to an increasingly difficult problem.

CHAPTER THREE

THE ETOWAH HCP

Background

In 2002, counties and cities in the Etowah basin, north of metropolitan Atlanta, began the development of a regional, aquatic HCP for the protection of three imperiled darters in the basin. The goal was to ensure the protection of the imperiled species while allowing the region to continue to grow and develop, unimpeded by the presence of the fishes. The plan was a preemptive measure. Before this point in time, developers in the area had not been required to apply for ITPs for development projects.⁶¹ The HCP was designed as a means of avoiding a future train wreck situation, where development might be halted entirely pending the completion of a plan. The River Basin Center at the University of Georgia served as staff to help the development of the plan. The Draft Etowah Aquatic Habitat Conservation Plan was completed after approximately five years of research, consensus-building, and policy drafting. The plan included seven categorical ordinances: Stormwater Management, Stream Buffers, Erosion & Sediment Control, Utility Stream Crossing, Road Stream Crossing, Water Supply Planning, and Monitoring & Adaptive Management. Notably, forest and agricultural practices were not included in this HCP as they were not determined to be sources of major stressors, making it the

⁶¹ There were several reasons given for the lack of ITP application: many of the projects in the Etowah fell under Section 7 and therefore did not need an HCP; other projects that would fall under Section 10 were given Section 7 status; the FWS encouraged projects to avoid Sections 7 and 10 when appropriate; it was difficult for the USFWS to find out about a lot of private projects until after completion, at which point it was too late to require an HCP; many private developers may not have known that they were supposed to write an HCP; and FWS did not have the staff to look for projects that are ESA noncompliant (Steering Committee Meeting Minutes, January 2003).

first HCP to solely address the effects of urbanization⁶² on endangered aquatic species. Despite this collaborative effort, the future of the Etowah Aquatic HCP remains undecided, as the USFWS has neither denied nor permitted the plan.

The Etowah watershed is a major headwater tributary in the Coosa River system that drains portions of 11 counties in northeast Georgia. It is of particular importance because of its ecological and economic potential. The watershed maintains exceptional biodiversity with 76 extant native fish species, three of which are federally listed; it was also (and may be, once again) an area of intensive commercial and residential development. The plan area for the Etowah HCP included Bartow, Cherokee, Dawson, Lumpkin, Forsyth, Paulding and Pickens counties in addition to the cities of Acworth, Ball Ground, Canton, Dallas, Dawsonville, Holly Springs, Roswell, Waleska and Woodstock ("Etowah HCP," 2007, p. 1).

Plan Components

Governance Structure

The EHCP was developed by a diverse group of stakeholders; their organizational structure included a steering committee, an advisory committee, a scientific advisory committee, and 12 technical committees.⁶³ The steering committee included a representative from each participating local jurisdiction, the Army Corps of Engineers, the Georgia Department of Natural Resources, the Cherokee County Water and Sewer Authority, and the Upper Etowah River Alliance. The representatives from the local governments were appointed by their respective city council or county commission. The representatives varied greatly; some elected officials were

⁶² Because effects can occur at relatively low levels of development, "urbanization" is used here and in the Etowah HCP to refer to any increase in development, including construction of low density suburban housing.

⁶³ Technical committees were established for each major component of the HCP. These committees were Stormwater Management, Runoff Limits, Erosion and Sedimentation Control, Grading, Stream Buffers, Stream Crossings and Culvert Design, Utility Stream Crossings, Water-Supply Planning Protocol, Conservation Subdivisions, Scientific Monitoring, Compliance Monitoring, Implementation

chosen, some members of the engineering or planning departments were chosen, and in one case, a developer was chosen to represent their community. These representatives were the voting members on the steering committee, while the others participated in an advisory capacity. The steering committee was responsible for finalizing all avoidance, mitigation, and minimization strategies in the HCP and the members were responsible for informing their respective governments on the progress of the Etowah HCP.

Technical committees were formed to address each stressor. The members of the technical committees signed off on the individual management strategies related to their stressor. The committees were composed of representatives of the development community, government staff, consultants and environmentalists. These individuals were recruited by the steering committee or had shown an interest in being involved in the production of the HCP. The advisory committee was in charge of overseeing the ‘big picture’ and included faculty, staff and graduate students from the University of Georgia and Kennesaw State University in addition to representatives from The Georgia Conservancy (TGC), The Nature Conservancy (TNC), the Upper Etowah River Alliance, and federal and state agencies. It was their job to assist the steering committee and technical committees by providing relevant research, participating in public outreach and education, and arranging meetings. The scientific advisory committee was made up of species experts and was responsible for conducting peer review of the critical scientific components of the HCP in order to ensure that the amount of take which would occur would still allow for overall viability of the species. Because the plan has such a large scope and application, it was crucial that the planners divided the work this way to avoid confusion and to streamline results. The creation and involvement of these committees contributed to the

relatively rapid completion of the plan (when compared to HCPs of similar size and scope, as discussed in Chapter 2) while remaining scientifically sound.

The plan area was clearly delineated: “the area covered by the [EHCP] includes all portions of the Etowah Basin that are in Bartow, Cherokee, Cobb, Dawson, Forsyth, Paulding and Pickens Counties, including all municipalities that lie within that areas, as well as the portion of the City of Roswell that lies within the Etowah. This covers 3,773 km²” (Etowah HCP, 2007, pg.6). Of those, Bartow, Cherokee, Paulding and Pickens Counties and various cities from the other counties submitted ITP applications. The remaining counties had opted out of the immediate ITP application; however, the plan “reserved” some amount of take for the remaining counties and towns located within the plan area should they decide to participate in the plan at a later date. The decision of whether or not to participate in the plan was completely voluntary; however, if take of a listed species continued to occur in the area and the ESA was enforced, each developer causing take would be required to produce their own HCPs in order to continue their activities.

Covered Activities

At the time of the HCP development (and the decade preceding it), the Atlanta metropolitan area added more people than any other region in the US other than Los Angeles, with Forsyth and Paulding Counties ranking amongst the most rapidly developing counties in the US (Jaret, 2002). The Etowah HCP was designed to address the increase in commercial and residential development that accompanied the population growth. The increase in impervious surface area from development was impacting hydrologic conditions within the basin which adversely affected the listed species. The ITP covered most activities associated with new development or redevelopment of land within the jurisdiction including any land disturbance

pursuant to construction, new construction of structures and impervious surfaces, substantial redevelopment of structures and impervious surface, and crossings of streams (utility and road) that are part of a larger common plan of development or sale (Etowah HCP, 2007, p. 8).

Activities which were not covered within the ITP included the construction of sewer lines, stormwater runoff from roads, utility crossings of streams that are not part of a larger common plan of development, and any other activities specifically exempted from local government control. The plan addressed the impact of potential reservoirs by providing a reservoir planning process. By providing a method for evaluating the relative impacts of water supply reservoirs on the covered species, the process of siting and permitting such projects would be streamlined while ensuring the consideration of the greatest protections to the covered species.

The Etowah HCP's covered activities are unique when compared to the covered activities of the other plans within my study (Appendix A). The Coachella Valley HCP covers development permitted by ITP holders and public facilities within the plan.⁶⁴ The Edwards Aquifer, Bull Run Water Supply, City of Kent Clark Spring's Water Supply, Lower Colorado River, Salt River Projects, and NiSource HCPs address the issue of population growth within their covered activities, but not as urbanization. The Salt River Projects cover the increase in size of their water supply reservoirs. The remaining plans address population growth in the context of water supply management and/or recreation, as a growing population demands increasing amounts of water to be withdrawn from the streams. Some development, such as the construction and maintenance of roads and utility crossings, accompanies these plans but not on such a large scale and over a plan area that consists largely of privately owned land.

⁶⁴ Despite this similarity, the plans vary greatly in other aspects discussed in more detail below.

Covered Species

The Etowah HCP addresses nine species of fish within the plan. It formally covers three listed species of fish: the endangered Etowah and Amber darters and the threatened Cherokee darter. These were chosen to be formally covered based on their status as federally listed. The remaining six fish species were not federally listed, but five were state listed and all of them were categorized as likely candidates for future federal listing. They were informally covered because they would benefit from the implementation of the Etowah HCP in ways similar to the covered species and thus the Etowah HCP would serve as an appropriate model should they be listed in the future, but the ITP for the Etowah HCP does not grant take of these fish. The informally covered fish include the Coosa chub (*Macrhybopsis* sp. cf. *M. aestivalis*), Coosa madtom (*Noturus* sp. cf. *N. munitus*), holiday darters (two species by that name; *Etheostoma* sp. cf. *E. brevirostrum*), freckled darter (*Pericna lenticula*), and the bridled darter (*Percina kusha*).

The Etowah darter (*Etheostoma etowahae*) is a colorful fish endemic to the Etowah River Basin (Wood & Mayden, 1993). Its known range consists of portions of the mainstem of the Etowah River and eight tributaries (see Figure 3.1). The species is rare and found only in areas with small rapids and riffles with a streambed of gravel and small pebbles (Etowah HCP, 2007, pg.11).

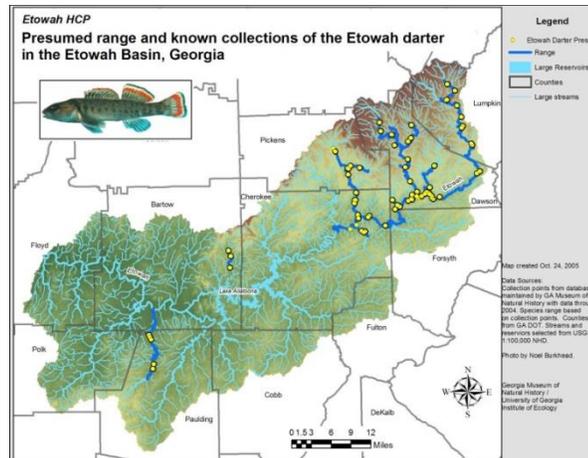


Figure 3.1: Presumed range and known collections of the Etowah darter in the Etowah Basin, GA (Etowah Aquatic Habitat Conservation Plan)

The Cherokee darter (*Etheostoma scotti*) is the most abundant of the three covered species (Figure 3.2) even though it is endemic to the Etowah River Basin. It is distributed throughout much of the basin, preferring streams with a width no larger than a few feet and containing “large gravel, small cobble and occasionally woody debris... moderate to slow riffles and the tails of pools... free of fine sediment or algal growth” (Etowah HCP, 2007, pg. 12).

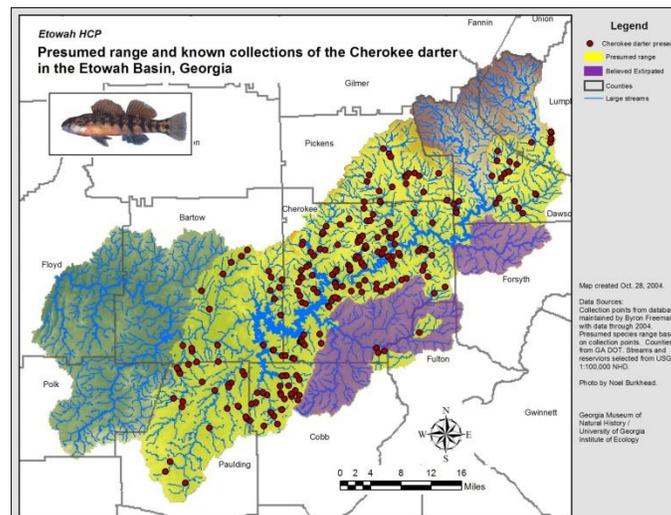


Figure 3.2: Presumed range and known collections of the Cherokee darter in the Etowah Basin, GA (Etowah Aquatic Habitat Conservation Plan)

The Amber darter (*Percina antesella*) is the rarest of the three covered species (Figure 3.3) and occurs only in swiftly flowing, shallower, rocky areas of the mainstem of the Etowah River and the lower portions of large tributaries. Additionally, the plan includes the biological needs of all of the informally covered species.

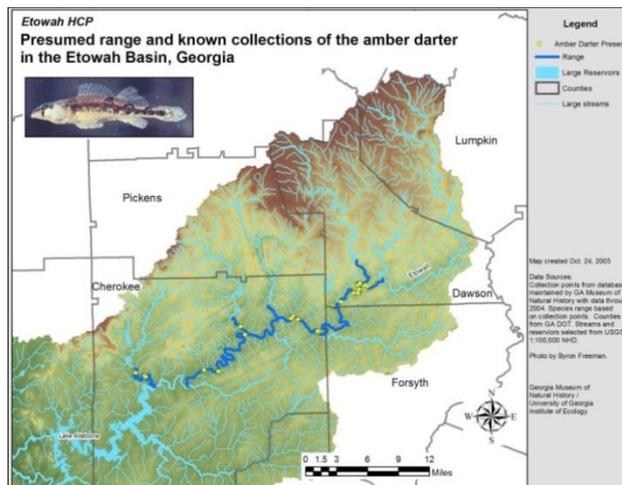


Figure 3.3: Presumed range and known collections of the amber darter in the Etowah Basin, GA (Etowah Aquatic Habitat Conservation Plan)

Take for the Etowah and Amber darters was expressed by loss of occupied habitat by acre while take for the Cherokee darter was expressed in number of individual fish lost. The discrepancy in the terms of take was due to the sensitivity of the Amber and Etowah darters in comparison to the Cherokee darters. The Cherokee darters are not as sensitive to the effects of impervious surface as the Amber and Etowah darters, who were found to be very sensitive to impervious surface⁶⁵ and declined when levels reached just four to six percent (Etowah HCP, 2007, pg. 43). Species occurrence models were created in order to delineate population thresholds. Under this model, activities permitted under the ITP would result in the loss of 1.03 km of habitat in Bartow County, 6.95 km of habitat in Cherokee County, 23.27 km of habitat in Dawson County, 0.57 km of habitat in Forsyth County, 1.95km in Paulding County, and 12.78

⁶⁵ Impervious surfaces consist of any land cover that does not allow the infiltration of water. These types of surfaces include roads, parking lots and rooftops.

km in Pickens County for the Etowah darter. Because of its smaller range, take was allocated to three counties for the Amber darter: 5.85 km of darter habitat in Cherokee County, 0.33 km of habitat in Dawson County, and 0.56 km of habitat in Forsyth County. As previously mentioned, take for the Cherokee darter was described in numbers of individuals and was distributed as follows: 26,831 individuals could be taken in Bartow County, 54,877 individuals in Cherokee County, 6,734 individuals in Cobb County, 5,685 individuals in Dawson County, 32,648 individuals in Paulding County, and 13,353 individuals in Pickens County (Etowah HCP, 2007, pg. 82).

Key Stressors

The HCP identified ten stressors for the darters, 6 of which were considered ‘major’ and were addressed in detail within the HCP. Sedimentation, hydrologic alterations, extensive riparian buffer loss, increased contaminants, movement barriers and channelization/piping were deemed to be the most crucial threats to the fish to address (Etowah HCP, 2007, pg. 35). Sedimentation from construction sites, channel erosion, and stream crossings that has settled on the streambed can degrade that habitat while suspended sediment can lead to behavioral changes, negative health effects, and mortality (Etowah HCP, 2007, pg. 23). Hydrologic alterations from reservoir operations, stormwater runoff, and water withdrawals can reduce base flows needed for species and create “flashy” hydrologic conditions that can wash out eggs and larval fish and cause the stream channel to widen and deepen.

Riparian buffer lost in order to maximize developable land can destabilize stream banks, allow more nutrients and contaminants into the water, increase water temperature and light penetration, and decrease the amount of woody debris entering the stream, all of which can lead to the fundamental alteration of the stream habitat. Contaminants from urban point and nonpoint

sources can cause negative health effects, direct mortality, and impair the production and degrade the quality of food sources for the covered species. Barriers to fish movement such as culverts and dams can prevent fish from completing their natural life cycles and can fragment populations, making them more susceptible to local extinctions from mild disturbances. Finally, the channelization and piping of streams for development or agriculture can reduce available food sources, cause hydrologic alterations, increase sedimentation, cause cascading negative effects downstream, or remove the habitat altogether.

Minimization and Mitigation Measures

The EHCP's mitigation and minimization measures were designed to address the six major stressors identified above; these measures include a set of policies regarding stormwater management, erosion and sedimentation control, stream buffers, road crossings of streams, utility crossings of streams, and water supply planning. The goal of these policies was to manage "development activities in ways that are protective of the species but are also protective of property rights, are economically feasible, and provide flexibility to property owners" rather than through the permanent preservation of lands (Etowah HCP, 2007, pg. 3)

The stormwater management policy was identified as the most important program under the Etowah HCP due to stormwater's total contribution of contaminants, sedimentation, and hydrologic alterations.⁶⁶ The policy limited the amount of stormwater runoff allowed to leave newly developed or reconstructed properties based on their location within the plan area. This was achieved through a Runoff Limits Program and the identification of development nodes. The program divided the watershed into three Priority Areas based on the distribution of the covered species. Priority 1 areas were subwatersheds that support the Amber and Etowah darters, the two

⁶⁶ Take was calculated in the absence of the stormwater ordinance. Without the ordinance, take violated the population threshold for all of the covered species.

most sensitive of the covered species. Priority 2 areas would protect populations of the Cherokee darters, which are less likely to be negatively affected by levels of effective impervious area. Priority 3 areas would support few or no imperiled species.

Each Priority Area has a different limitation for runoff from development; runoff from Priority 1 areas could not exceed the volume of runoff that would occur under a forested condition for small storms while Priority 2 areas could not exceed the volume of runoff that would occur under the condition of 5% impervious cover. Priority 3 areas would not be required to meet any runoff limits. In order to provide flexibility for areas such as major transportation corridors where intensive development is planned, the program allowed local jurisdictions to establish limited “development nodes” with less restrictive runoff limits. Additionally, there was an optional conservation subdivision policy that would provide flexibility in meeting the Stormwater Runoff Ordinance requirements.

The remaining five policies were less extensive than the stormwater policy, however, they also offered significant benefits to the fish. The erosion and sedimentation control policy required pre-construction meetings before development, semi-monthly reporting, minimum inspection frequencies, limited grading activities during construction to a rolling footprint, and designation of emergency on-call E&S personnel from each development. The HCP staff would create a checklist for building inspectors to use in order to assure compliance. The stream buffer ordinance standardized the requirement for a 50-foot riparian buffer which was already in place in many of the more urban jurisdictions within the watershed. Road crossing and culvert requirements applied to streams larger than $.2 \text{ mi}^2$ in drainage area. Bridges, bottomless culverts, or embedded box or pipe culverts would be required for streams ranging in size from 20 mi^2 to $.2 \text{ mi}^2$. Bridges would be required for larger streams while streams smaller than $.2 \text{ mi}^2$ were exempt

because they are too small to support any of the covered species. Variances were made available for developers who could prove that their proposed alternative would have no greater impact on the fish than the HCP standard. Utility crossings would be required to use directional boring when possible, although the plan provides multiple alternatives in the cases when it would not be possible. The water supply planning protocol provided a framework for local governments to evaluate potential reservoir locations so that they would cause the least amount of damage to the covered species.

The Etowah HCP is truly unique in its conservation measures because it does not require any physical mitigation such as restoration, rehabilitation, or land acquisition. Instead, its mitigation is the implementation of preventative policies applied to future development, the goals of which are to minimize the take of species and prevent the need for costly, retroactive measures. Many of the plans use a combination of policy implementation and physical restoration; I did not find any approved HCPs or any under development that exclusively relied upon policy implementation as the Etowah would have. For example, the Coachella Valley HCP's covered activities are the most similar to those of the Etowah HCP, however, it required land acquisition and extensive physical, costly management such as species augmentation, habitat restoration, and offsite mitigation in addition to flow regulations (Appendix A).

The developers of the HCP made an uncommon choice by explicitly outlining the connection between the key stressors caused by the covered activities impacting the covered species and how the HCP management measures would directly address each of those stressors. This method makes logical sense because it assures that all management measures are necessary and not arbitrary, but it was not a common practice in the development of the aquatic HCPs within my study. Each of the HCPs described the habitat requirements of the covered species and

the management terms in great detail, however, many of the plans skipped the step of defining the key stressors, assuming that they were obvious or indirectly explained within the plan.⁶⁷ In the remaining cases, about half distinguished the key stressors, but did not link them to specific management terms. While specifically linking the habitat requirements to key stressors from covered activities to the minimization and mitigation measures may be perceived as extraneous given the intuitiveness of the connection, its inclusion is important to guarantee that the best science is being used and to illustrate the specific purpose of each of the management terms.⁶⁸

Adaptive management

The adaptive management sections of HCPs vary significantly and are one of the most highly contested aspects of the HCP process (Wilhere, 2002). The goal of adaptive management is to provide the flexibility to alter management strategies in case the initial HCP measures prove to be inadequate, over-adequate, or in the case of an event that alters the needs of the covered species. The Etowah Aquatic HCP Board would be required to approve any implementation of adaptive management measures rather than the applicants.⁶⁹ If any of the applicants were dissatisfied with the change, they would have been free to withdraw from the HCP. Adaptive management for the plan would have been informed by two monitoring schemes: compliance and scientific. Compliance monitoring would verify the enforcement and implementation of the HCP by the jurisdictions while the scientific monitoring would include field measures, water quality monitoring, and updating the digital databases. As with the other HCPs incorporated into my study, the comprehensive adaptive management plan was not complete for the draft HCP;

⁶⁷ Key stressors were the most difficult element of the plans to include in Appendix A; many were inferred rather than explicitly defined.

⁶⁸ Providing these connections adds a layer of strength and accountability to the HCP. This strengthens the protection for species, but in situations where there is pressure against an HCP, this explicit connection prevents the plan from being weakened as a compromise.

⁶⁹ The Etowah Aquatic HCP Board oversees the Implementing Organization and is made up of one representative from each of the local governments participating in the plan in addition to ex officio members from the Georgia Department of Natural Resources and the USFWS (Etowah HCP, pg.105).

detailed methods of scientific monitoring, data requirements, and the level of certainty required to trigger adaptive management were under development at the time of the draft plan submittal.

The extensive research and monitoring program required by the HCP would provide assurances that the plan would run on the most up-to-date information. For example, the applicants would be required to provide notification if they modified the location of development nodes within their jurisdictions.⁷⁰ Additionally, changes to the effective impervious area (EIA) and Conservation Areas Maps would be required any time a development project took place, a variance was issued, or new lands were permanently protected.⁷¹ Changes in the predictive and population threshold models, either through the input of up-to-date data or through changes to the modeling methods themselves, would also impact the stormwater policy. The results of these updates would decide what adaptive management protocols, if any, were triggered.

The plan included 36 additional adaptive management measures which could be triggered by monitoring results. The distribution of these measures varied greatly with the stormwater ordinance accounting for 15 triggered actions and the water supply protocol accounting for just one – to adjust the protocol as additional studies were produced. The remaining potential actions included strengthening or relaxing specific measures, increased staff training (if compliance monitoring showed failing implementation based on enforcement), and minor changes to procedural requirements. The inclusion of the loosening of requirements is significant, as it demonstrates a real desire to limit the economic burden of the HCP to just that which is necessary for the protection of the fish.

⁷⁰ Node location changes were subject to approval based on the results of the Etowah Aquatic HCP Species Predictive Occurrence and Abundance Model; the model could not indicate that the location change would result in predicted loss of habitat that exceeded the population threshold or take levels of that jurisdiction.

⁷¹ EIAs are impervious surfaces that are directly connected to streams either through drainage or alternative conveyance systems. These are the most problematic impervious surfaces because they cause rapid changes in hydrologic conditions and they directly transport contaminants to the stream with no chance for filtration.

Alternatives to take

The Etowah HCP considered two alternatives to the plan: land preservation and no action. ‘No action’ considered the scenario of unchecked development in the area with no controls for the protection of the species. This was found to be an unviable option due to the amount of take of the listed species which would occur. The alternative scenario of land preservation was not viable due to the extensive amount of land required to adequately protect the species. As discussed in Chapter 2, to adequately protect aquatic species strictly through land preservation would require the protection of a significant portion of the watershed. In the case of the Etowah, it would require that more than 100,000 acres and billions of dollars in order to ensure the survival and recovery of the covered species. Section 4.7 also briefly mentions the option of banning all development in the area that would result in take, but dismisses that option as unconstitutional.

Funding

The Etowah HCP is unique in that it is the only HCP within my study that does not require the ITP holders to shoulder the majority of the financial burden of their conservation measures. Instead, the funding obligations for these measures would fall on the shoulders of the developers and land owners involved in individual projects.⁷² The method would have funded the administrative and monitoring staff of the Etowah Aquatic HCP Implementation Organization⁷³ (Implementation Organization) through a development fee per disturbed acre that could have been adjusted based on growth rate in the plan area. In order to determine the initial fee, the advisory committee calculated the average number of acres under development in the

⁷² If an ITP holder was developing a project, they would be required to adhere to the same HCP standards as private developers, and thus, would contribute a portion of the funds for the HCP through that mechanism.

⁷³ This organization would have been created after the issuance of the ITP as a coordinating body whose job was to assist local governments in implementing and administering the HCP in addition to overseeing monitoring, adaptive management and training associated with the HCP. It would be overseen by the Etowah Aquatic HCP Board.

participating jurisdictions from recent years (about 7100 acres). The estimated cost was divided by the expected number of disturbed acres in the near future and the fee was set at \$85/acre. This fee would be collected by the respective jurisdiction and then forwarded to the Implementation Organization.

This funding mechanism was chosen because it was thought to be able to generate the amount of funding needed to implement the Etowah HCP while equitably distributing the cost of implementation across those users who were actively participating in the ‘take’ of the covered species. Ideally, this method would have alleviated negative externalities by incorporating the cost of the loss of an imperiled species into the market price of development and it would have distributed the costs across a large number of users instead of concentrating the costs on a particular city, county, or private individual. These benefits made it an attractive alternative⁷⁴ to the common practice of private funding.

Public Participation

Due to the complicated political situation surrounding the Etowah HCP, the inclusion of the public was even more imperative than with most plans. As discussed above, the governance structure of the HCP included a diverse group of stakeholders, but public participation reached beyond that structure and into the community. The developers hosted “over 150 meetings, presentations and workshops, newspaper articles, radio interviews, a website, the distribution of printed outreach materials and meetings with staff members from the Georgia Congressional delegation,” in addition to hosting copies of notes from the official committee meetings (Etowah HCP, 2007, pg. 9). The outreach coordinator attended meetings of relevant community members, such as developers and conservation organizations. Members outside the local community were

⁷⁴ While some developers may have felt this was an unfair burden, there was no mention of such feelings in the public comments, thus, we can assume that the community at large believed this to be a fair solution.

also engaged; a USFWS staff member organized meetings specifically for federal and state senators and house representatives during the first few years of planning. The staffer passed away during the development of the HCP and although another staffer assumed that role in an official capacity, the staffer was not active. The continued involvement of state and federal government, even with poor attendance, could have prevented the outbreak of misinformation and the resulting political pushback discussed in detail below. Additionally, a high ranking member of the advisory committee made efforts to continue open dialogue with Georgia DNR and the state governor in order to keep them abreast of the situation.

Current Standing

Between September 2006 and April 2007, in the midst of strong political tension, 13 entities, both cities and counties, submitted applications for ITPs for take of the Etowah, Cherokee, and Amber darters under the requirements of the Etowah Aquatic Habitat Conservation Plan (http://www.etowahhcp.org/hcp_components.htm). The public comment period for the Draft Plan resulted in 508 comments being submitted to the Region 4 HCP Coordinator. Of these 508 comments, 492 were form letters or simple letters of support for the HCP and two were simple letters of opposition. The remaining 14 comments were substantial and distinctive comments made by heavily invested individuals; six in favor of the HCP, six in outright opposition to the HCP, one request for further analysis, and one request for suggested revisions. The divided support of the substantial comments reflects the political divide surrounding the plan. Although the plan had high levels of public participation, involved a wide variety of stakeholders, had strong public support, and addressed both the economic needs of the region and the ecological needs of the aquatic species covered by the plan, it was seen as

contentious by some.⁷⁵ Although an Environmental Assessment was produced for the plan, it never received a Statement of Finding from the USFWS; this was partially due to situational circumstances and concern about the funding mechanism upon which the HCP relied.

A second attempt is currently underway to protect the endangered darters – a conservation bank. Conservation banks are parcels of land that are permanently protected as habitat for endangered, threatened, or at-risk species under the Endangered Species Act. These land parcels are owned and managed by a private entity. Banks may be created on any non-Federal lands which have not previously been designated for conservation purposes. Once created, the sites are evaluated by the USFWS and awarded a certain number of credits which are then available for sale to any non-federal entity in need of mitigating take of an endangered species. Large sites that are suitable for multiple species or are high quality for a certain species are preferable; this is considered by the USFWS in evaluating sites for credit value. Applicants seeking an ITP for a species within the service area⁷⁶ of a bank may include the purchase of credits as a mitigation action described in their HCP. Conservation banks are a popular conservation tool in the western states, but have increased in popularity in the Southeast in recent years.

While species that reside in ephemeral ponds and wetlands have been included in conservation banks, no banks have been permitted for lake and river species by the USFWS. Corblu, a private consulting firm specializing in conservation banking, ecosystem restoration, traditional environmental consulting, and development of emerging environmental markets, has submitted an application for the Deerleap Preserve Conservation Bank, which would be located in the Etowah watershed. The bank will protect and provide management for 940 acres of

⁷⁵ For more details, see “political pressure”

⁷⁶ A service area is defined as the geographic range in which a bank may sell credits to offset impacts; it is based on the biological needs of the species in addition to spatial considerations

“pristine occupied stream habitat and associated riparian and upland habitat in the headwaters of the Etowah” if it is permitted (Sands, 2012). There is mixed speculation concerning the bank; some believe that the permitting of the bank will encourage the passage of the HCP, allowing the two to work in conjunction with one another; if a developer was unable to meet all the terms of the HCP, they could purchase bank credits to mitigate their additional take. Others believe that the bank will supersede the need for the HCP. I am skeptical of the ability of the bank to successfully protect the darters alone based on the results from the models used to inform the Etowah HCP. The bank has not yet been approved by the USFWS, the documentation and informative science for the bank is proprietary, so I am not able to address those concerns at this time.

Barriers to Successful Implementation

A draft of the Etowah HCP was completed in 2007, underwent the NEPA process, and was published to the Federal Register for public comment. Despite the publication of an EA that found that the HCP was a viable option in the Etowah Basin, the USFWS failed to release a finding of no significant impact or issue an ITP for the plan. The key variables that are likely to have contributed to the situation are timing, political pressure, and the funding mechanism employed by the HCP, all of which are intimately connected.

Funding

The Etowah HCP funding mechanism was chosen based on the low estimated costs of HCP implementation (when compared to comparable plans) and the rapid development seen in the area prior to the housing market decline of 2008. Had development continued at its early 2000s pace of around 7100 acres per year, it would have ensured the estimated \$600,000 per year cost required to staff the Implementation Organization (Etowah HCP, 2007, pg. 105).

Unfortunately, the plan did not have an alternative funding mechanism in place in case the development slowed and disturbed acres ceased to exist in the plan area.

In 2007, the U.S. housing market began to decline and, in 2008, the stock market followed (Farmer, 2012). The members of the steering committee were not prepared for this unexpected turn in the economy, which had a profound effect on development in Atlanta and its surrounding areas (Lee & Immergluck, 2012; Whelan, 2012). According to Whelan (2012), the state of Georgia led the nation in bank failures, resulting in “hundreds of thousands of vacant or half-finished lots and tens of thousands of homes lost to foreclosure in the suburbs” (pg. 1). With development all but stopped in the Etowah watershed, the Etowah HCP lacked the appropriate funding to maintain the Implementation Organization. In fact, there were zero disturbed acres in the plan area during the time of the Environmental Assessment, according to USFWS employees, generating no funds for implementation. This economic downturn has been cited as a reason for a delay in implementing the plan, although it was not mentioned in the EA (Dell, 2013; Prowell, 2013).

Political pressure

As previously discussed, the Etowah HCP was developed in a political climate similar to that of the Cumberland HCP. Most of the HCPs in my study take place in areas where the Services have a history of regular enforcement of the ESA, or are the actual product of such enforcement (such as in the case of the Edwards Aquifer HCP). Region 4 of the USFWS, barring Florida, does not have the same history of enforcement; land developers in the Etowah Basin had not previously experienced stalled or prohibited projects based on ESA enforcement. Without the threat of burdensome penalties and development delays that would result from take in violation of the ESA, there was little motivation to implement an HCP; the HCP itself seemed like the

burden to many.⁷⁷ However, nearing the completion of the Draft Etowah HCP, the HCP collaborators believed that those initial political obstacles had been resolved through public outreach, education, and participation (Steering Committee Meeting Notes, 2006).

Unbeknownst to them, however, the Council for Quality Growth (CQG), a state-wide trade organization for developers, was harboring opposition. They created and distributed inaccurate and inflammatory materials in preparation for an information meeting for community developers and they invited a member of a federal Georgia senator's staff to come speak against the HCP at the final meeting of the steering committee, following the approval of the HCP (Fowler, 2014). As the applicants were preparing to submit their ITP applications, the CQG sent a letter requesting the delay of the project; the steering committee allotted the CQG two weeks to explain their concerns for the committee's consideration. However, when the CQG failed to meet the deadline, the applicants proceeded with their submittal. The steering committee knew that the CQG would have a chance to voice their concerns during the public comment period and they were anxious to begin processing their application. Despite their previous behavior, staff at the CQG attended the signing ceremony in September of 2006 in what was perceived as a sign of support (Fowler, 2014).

The suspension of political attack was temporary, however, and the backlash was substantially more severe following the signing of the application. Members of the CQG staff and an engineer in the area attended the public meeting in which the local government of Forsyth County voted on adoption of the plan. The room contained signs opposing the plan, claiming that the HCP would allow the federal government to take people's private property; the open forum was monopolized by CQG staff and an engineer from a local company who adamantly opposed the plan (Fowler, 2014). They lobbied all of the local governments in the watershed, asking them

⁷⁷As previously discussed, HCPs are used as a tool for landowners in areas where violations of take are prosecuted.

to oppose the HCP; they were able to convince a number of the original participants to delay their submission of the ITP application, however, four counties and ten cities chose to continue their participation in the plan ("In the Loop," 2008). It is likely that those which dropped out of the process would voluntarily opt back into the HCP following its approval if participating jurisdictions saw the expected results.

Georgia state senator Chip Pearson also opposed the HCP and expressed his displeasure to the regional USFWS office.⁷⁸ The office received numerous phone calls from the senator and his colleagues, encouraging the office to deny the applications. On August 11, 2009, Pearson appeared at a meeting to discuss the plan, requesting that it not only be abandoned, but suggesting that the darters be removed from protection entirely ("People pack darter plan public hearing," 2009). A few days later, 10 days before the ending of the public comment period for the Etowah HCP, the senator released a sarcastic, biting article attacking the Etowah HCP. He begins the article by calling the HCP "Obamacare for minnows" and with a disclaimer which states he is using sarcasm for this serious issue because "sometimes it is better to laugh than cry". The overall claim of his article is that the Etowah HCP "is not about the fish... but about an out of control federal government wanting to micromanage every part of your life" (Pearson, 2009).

The article is alarming, not only because of the inflammatory language, but the sheer inaccuracy of it. In addition to pressuring the USFWS, the senator and CQG attempted to discredit the plan via alternative methods. UGA's River Basin Center and Institute of Ecology's books were audited multiple times because of their role as staff and advisor for the development

⁷⁸ In 2010 it came to light that Pearson, who was chairman of the state Senate Economic Development Committee, was also a co-founder of an economic development consulting firm. His association with the firm drew red flags when it was reported that he had possibly sponsored legislation for the benefit of his business partners ("Senator's firm capitalizes on his office," 2010). Although there were no official charges filed against him, he withdrew from the reelection campaign after the story broke. This is relevant to the Etowah because it brings into question the validity of his opposition to the plan.

of the plan (Fowler, 2014). Meanwhile, the CQG deluged the plan developers with Open Records Act requests. These attacks generated controversy at UGA and resulted in the director of the River Basin Center being compelled to testify at a facilities committee hearing of the Georgia Senate about the HCP. Additionally, USFWS staff and RBC staff were repeatedly called to speak with several federal senators and representatives about the HCP.⁷⁹ Although there were no long-term repercussions for individuals from these actions, they likely played a role in the stalling of the HCP processing and are a testament to the ramifications of environmental enforcement in such a growth-centric political climate.

Timing

The timing of the HCP played an important role in both the funding and the political implications for the HPC. As previously mentioned, there is uncertainty over the exact review dates of the HCP due to the amount of time which has passed since the submission of the ITP applications. In order to establish the best possible timeline, I have used the dates on the federal documents and the endnote in the last publically available steering committee meeting (Draft Aquatic Etowah HCP and Draft EA for the Etowah HCP). According to the meeting minutes, the application was signed by participating jurisdictions in September 2006, before the beginning of the economic decline. The Regional Office (Region 4) ordered the field office to complete the EA rather than contracting it out to a consulting firm. On June 30, 2009, the draft EA was published in the Federal Register for public comment. When asked, staffers in the field and the regional offices of the USFWS have said that the delay in the review process was due to the limited number of people working on the EA and that in hindsight, it would have been more efficient to contract the EA to a consulting firm (Prowell, 2013). This sentiment was reaffirmed

⁷⁹ In order to assure the legality of the plan, that it was voluntary, that it had been initiated by the local governments, and that those governments had voted on participation in a public forum.

during a training course when USFWS employees said that they had only heard of a handful of NEPA documents being completed by the field office rather than contracting them out to a consulting firm.

The delay in processing of the HCP would not have been more than an annoyance had the economic recession not occurred simultaneously. Presumably, the decreasing trend in development was not apparent during the development of the EA, as it was not mentioned as a possible hindrance to implementation. However, by the time that the draft was made public in 2009, the economic crisis and the inability of the funding mechanism to support HCP staffers were apparent. Throughout this process, the local government wrote to the USFWS regional office to encourage a completed review, but to no avail. The delay coincided with the turnover of local government seats and by the time the USFWS had determined that the funding mechanism was not suitable for the implementation of the plan, new officials had been elected and they were not interested in revising the plan to meet ESA requirements (Dell, 2013). As it stands now, no FONSI has been issued but the application request has also not been denied; it remains static due to the lack of support to push it forward.

Alternative Funding Mechanisms

Had the HCP participants elected to pursue alternative funding mechanisms, they would have had to have been creative. There are five potential funding mechanisms besides disturbed acre fees outlined within the HCP Handbook (1996), although it is uncertain how likely they would be to have worked in the Basin.

Other mitigation fees

This approach would be the most similar to the disturbed acre fee as it would be the simple application of a fee to an activity or item, such as a recreation fee or a water surcharge. A

fee is a simple solution as it is easy to apply across political lines. The difficulty in this approach would be finding an activity or resource that would be appropriate to charge. While the disturbed acre fee fairly and appropriately charged those who were actively causing the ‘take’ of the covered species, other fees could act as an unfair burden on third parties. Additionally, even if an alternative activity or resource was charged, there is no guarantee that the charge will be sufficient to provide the funding needed for the Implementation Organization; development is the only industry that would directly impact the work load, and thus the funding demands, of the Implementation Organization.

Special districts⁸⁰ under state law or county ordinance⁸¹

The state of Georgia requires that cities and counties operate under a service delivery strategy which defines the services to be provided by each jurisdiction and regulates how these are funded. As these services and tax appropriations are pre-defined in state law, it would be an arduous task to redefine special districts in the counties and cities of the plan area. There is precedent, however, for counties to sue to define their own service districts and funding mechanisms. In 2012, after years of litigation, 16 Georgia counties finalized a settlement with the state allowing them to define their own service districts. While the entire county paid additional taxes for certain benefits, such as a recreational fund to support local parks, four service districts were established for police, fire, medical, and development and enforcement districts were established. In these districts taxes are collected from those who receive these services from the county rather than from an incorporated city. This precedent reinforces the legality of establishing a service district for counties that wish to pay taxes towards an Etowah HCP fund, but the construction of such a district would require a public vote.

⁸⁰ Special districts are municipal subdivisions in which separate assessments of taxable property are made.

⁸¹ Information for this section found on Gwinnett County’s special districting website.

There are multiple factors that would influence the likelihood of special districting in the case of the Etowah HCP, although they all fall into the larger scale of social norms and economic benefits. Social issues which may influence a society's willingness to enter into a voluntary conservation plan at an economic cost to themselves include the political climate of the area, the perceived social norms of the neighboring communities, and the threat of regulations being enforced (in a situation where social norms do not support the conservation program). Economic considerations typically include the cost advantage offered by voluntary agreements and the availability of assurances regarding future regulation (Chen, Lupi, He, & Liu, 2009; Langpap & Wu, 2004). Given the strong political opinions which surrounded the Etowah HCP in 2009 and the absence of political champions of the plan in the local governments, a public vote for this appears unlikely at the present.⁸² This is complicated by the fact that a conservation bank may be permitted in the area for the protection of the three covered darters, decreasing the perceived threat to the darters. Conversely, with public outreach and advocacy in favor of the HCP, a resurgence of interest is possible given the proper circumstances.

Public opinion can be influenced through a variety of means when certain conditions are met.⁸³ A campaign that highlights the positives of the Etowah HCP while dispelling concerns and corrects misinformation may be a feasible approach to take in changing the public opinion regarding the Etowah HCP. Including commentary from unbiased experts who are perceived as having experience and technical knowledge is one way to provide credibility to a campaign, as using commentary from advocacy groups can have a negative impact on attitude change (Page,

⁸² See *Political Pressure*

⁸³ Although persuasion literature varies on the exact mechanism of attitude change and public opinion, there are 5 basic terms which must be met in order for new information to lead to attitude change: the information must be (1) actually received, (2) understood, (3) clearly relevant to evaluating policies, (4) discrepant with past beliefs, (5) credible. While these terms do not always lead to successful persuasion, persuasion cannot be achieved if any of these steps are missing.

Shapiro, & Dempsey, 1987). The finality of extinction is a second indicator that individuals in the basin may be likely to embrace a resurgence of the Etowah HCP (Sinatra, Kardash, Taasoobshirazi, & Lombardi, 2012).

With public support behind the HCP, it would be possible that residents of the basin would voluntarily contribute to funding of the Etowah HCP through special districting. Individuals' voluntary willingness-to-pay for environmental services has been found to increase significantly as the permanence of an environmental disaster increases. While Langpap & Wu (2003) found that the background threat of regulation plays a strong role in an individual's willingness-to-pay for environmental services, a study completed in China (Chen et al., 2009) concludes that social norms at a neighborhood level can have a substantial impact on the participation of individuals in conservation investments, even with no regulation and an economic loss to themselves.⁸⁴ This dichotomy highlights the importance of advocacy for the darters in order to ensure that the residents have a clear understanding of the situation and back the HCP as a community. Finally, addressing the stormwater management programs potential to establish the basin as a model for similar communities may increase their willingness to accept the increased cost of development within Priority areas 1 and 2. Given these factors, with public support, special districting is a feasible funding mechanism for the Etowah HCP.

Funds contributed by non-profit or private individuals/State or Federal funds

These funding sources are considered collectively for the purposes of this paper as they have similar requirements for success in funding the Etowah HCP. Any funding from outside sources, whether government or private, could be utilized if appropriate grants were secured. The procuring of grants alone would be unlikely to satisfy the funding requirements of the HCP

⁸⁴ The social norms are based on a neighborhood level and are sustained by feelings attached to the increased reputation and self-esteem garnered by conforming to social norms or the shame and guilt garnered by detaching from the norms.

Handbook (1996) because appropriate funding needs to be demonstrated before the ITP is issued. Grants may be procured to assure funding for the first 3-5 years of the HCP implementation, but the lack of certainty in the future of the funding would preclude it from being an acceptable mechanism for supporting the HCP through its duration.

Alternatively, participating governments could provide funds directly to a general fund for administrative costs. If costs were estimated to remain at approximately \$600,000 per year and six or more governments participated, the fiscal burden to each participant would be relatively low. This would be a feasible option given a political climate in which the public supported the plan's implementation.

Tax check-off programs⁸⁵

Tax check-offs programs are voluntary additions to a state's income tax that allow individuals to donate a specific amount of their income towards the charitable programs listed. Georgia has eight tax check-off programs listed on their state income tax forms from wildlife conservation to elderly care in the state. While tax check-offs can be used to promote wildlife protection, it is not an option for the Etowah HCP because only state established programs are eligible to be listed on Georgia's income tax form.

Recommendations

My recommendation for future HCPs using a similar pay-as-you-go funding fee is to secure private or public grants as a cushion for those years in which the service/commodity to which the fee is attached is significantly decreased or absent altogether. Alternatively, for HCPs with counties, cities, or states as permittees, I would recommend adding a clause which obligates each participant to provide a pre-determined portion of the funding requirements in years during which fees are insufficient for full funding. Lastly, I would suggest investigating state laws on

⁸⁵ For more information see www.checkoffgeorgia.org

special districting and consider moving forward with establishing a tax for the HCP alongside the development of the HCP. By simultaneously adjusting the special districting and developing the HCP, permittees can avoid a lag time between the submission of the HCP and the issuance of the ITP by having the funding mechanism preemptively in place.

Discussion

The mandated protection of the endangered darters under the ESA is the main reason for the development of the HCP, but the anthropocentric benefits need to be considered as well. Despite the protests from misinformed senators and concerned developers, the production of the Etowah HCP was not simply an ecocentric endeavor. Although the ESA was created to protect biodiversity for its intrinsic value, the application of the ESA can have significant positive impacts for humans as well. As previously discussed, the darters have very specific needs for reproduction; they require clear water with gravel or cobble substrates and swift runs or riffles. While all three are sensitive to sedimentation and increased contaminants, the Amber and Etowah darters are particularly sensitive to these stressors. Because of their sensitivity, these species make excellent indicator species, i.e., they can act as a biological barometer for water quality. Their continuing existence shows that the water is likely safe for humans to swim in while their recovery would indicate even higher levels of water quality. The collaborators of the HPC understood these benefits and informed the public that protecting the darters would protect the drinking water and the recreational value of Lake Allatoona. Had the Etowah HCP been implemented, the water of the Etowah watershed would not only have been preserved for the darters, but it also would have been cleaner and healthier for the people who rely on it.

Beyond water quality and biological benefits, the Etowah HCP offered the counties of the basin an economically feasible and expedited vehicle to address regulatory requirements. While

there was a high demand for new development in the area, some projects faced potentially lengthy regulatory delays from Section 7 consultations required in order to assure the protection of the covered species. At the same time, much habitat of listed species was being taken in the absence of ITPs and HCPs due to limitations in USFWS staff (Etowah Aquatic HCP Overview). This created a situation that was frustrating for developers and inadequate for the protection of the darters. The scientific papers produced during the construction of the HCP to inform its management terms are now officially part of the scientific literature and must be considered when evaluating development projects. The USFWS has a stronger understanding of the darters, the locations of their populations, their habitat requirements, and their life cycle than ever before. Armed with this information, the Services should exert increased enforcement of the ESA in the basin, increasing the need for such a plan.

The situation of the Etowah HCP illustrates many of the difficulties faced by any aquatic HCP, but, more importantly, it provides insight for those attempting to develop aquatic HCPs in the Southeast, where politics frequently do not align with the goals of the ESA. Some of the difficulties were outside of the HCP collaborators' control, as barriers to the success of an HCP frequently are. The timing of the housing collapse, for example, coinciding with the review of the plan and highlighting the inadequacy of the funding mechanism was outside of the control of the developers. However, this may have resulted in a plan that was strengthened against future lulls in development had political tension, opposition, and loss of local government champions not prevented it.

Additionally, the plan illustrates the paradox of protecting the species to the maximum extent practicable while compromising with landowners. Had the plan not so clearly outlined the covered activities, connected them to key stressors, and connected those stressors to species

needs, perhaps there could have been more leniency in adjusting the highly contended stormwater runoff limits. The reduction of the runoff limits could have, in turn, reduced the opposition against the plan which could have facilitated the implementation of appropriate alternative funding. It begs the question of whether the covered species would be better off with a weaker plan in place than no plan at all. This is one of the many issues that fuel the HCP debate well outside of the context of the Etowah HCP.

Conclusion

Aquatic HCPs are trending towards spatially large, multi-species plans that address key stressors related to an increasing human population. The trend towards geographically large plans is crucial for the success of aquatic plans due to the connected nature of watersheds; in order for an imperiled aquatic species to be fully protected, certain conditions must be maintained upstream, adjacent of its habitat. It is suggested that the trend towards multi-species plans may result in some species receiving inadequate management, however, this phenomenon warrants more analysis in the case of strictly aquatic plans. The connectedness of the species and their habitats may result in the consolidation of management and monitoring protocols, easing the strain of including multiple species. Lastly, the trend towards addressing issues of urbanization and population growth reflects a larger land-use trend. Although these trends are present, it is important to stress that most HCPs will vary significantly from other plans due to dissimilarities in key components of the plans such as Region, covered species, key stressors, and covered activities.

Because of these trends, however, it will be more important than ever to understand the components of existing aquatic HCPs, the mechanisms that supported their development, the management terms that are commonly practiced, and the success and failure of those terms. My

work here takes the first step towards that goal, providing a collection and analysis of available plans, their histories, and their components in addition to developing a series of recommendations for the Services and future applicants. The next step is to begin implementing these recommendations: to encourage the use of HCPs, develop and implement ways to assist applicants with the development of the plans, and support the Services with the analysis and approval of plans.

A comprehensive assessment of the success of aquatic plans based on population stabilization or recovery would be a useful resource for informing future plan development. In conjunction with this paper, it would illustrate which management terms have been most successful in fulfilling the needs of both the applicant and the covered species and could accelerate the plan development by the applicant. Additionally, applicants who rely on a resource-use fee to fund plan implementation need to incorporate an alternative funding source into their plan; resource use is variable, and the fee may not provide adequate funds during years of limited resource use. By incorporating this safeguard into the plan from the beginning, delays following draft submission can be avoided.

The development of a navigable, up-to-date database of HCPs with the ability to be filtered by aspects such as covered species, take allowed, applicant(s), Region, and permit duration would also be a useful resources for the Services and applicants. It would allow the Services to make a comprehensive determination of allowed take based on how much has been allowed by other plans, it would facilitate a means for creating conjoining reserves, and it would expedite the process of ITP application processing. This acceleration of processing would be especially significant for local governments because of the high turnover associated with these positions; it is easy for a project to lose momentum after an incumbent has been replaced and can

result in an abandoned HCP. However, before any of these other steps can take place, landowners must first be incentivized to develop an HCP. Some landowners may develop a plan out of a desire to protect species, but most develop plans because it benefits them financially. Strict enforcement of the ESA in areas where imperiled species are present is necessary for these plans to be seen as useful and advantageous tools rather than impositions. This is the first and most crucial step in the future success of HCPs.

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APPENDIX A – HCP Components

Appendix A provides a comprehensive table of HCP components for the plans included within my study. A key for management terms can be found in Appendix B.

HCP	Planning time	Species Covered	ITP Holder (s)	Covered Activities	Key Stressors	Management Terms ⁸⁶	Funding Mechanism
Bull Run Water Supply HCP	<p>Notice of intent to prepare EIS (NoI) March 27, 2006</p> <p>DEIS (DEIS) available April 11, 2008</p> <p>ITP received (ITP) April 9, 2009</p> <p>3 years</p>	<p>-Lower Columbia River Chinook Salmon (Spring & Fall)</p> <p>-Lower Columbia River Steelhead (winter)</p> <p>-Lower Columbia River Coho Salmon</p> <p>-Columbia River Chum Salmon</p> <p>-Pacific Eulachon</p> <p>-18 unlisted species</p>	City of Portland, OR, Water Bureau (public)	<p>Operation, maintenance, and repair (O&M) of the water systemⁱ</p> <p>Incidental land managementⁱⁱ</p> <p>Operation and Maintenance of roads, bridges, culverts, & parking lotsⁱⁱⁱ</p> <p>Implementation of AMM terms</p>	Habitat degradation	<p>HH1, HH4</p> <p>HR1, HR2, HR5</p> <p>SA6</p> <p>RF1, RF4</p> <p>OM1 (HR9, HR8, HR4), OM4, OM6</p>	<p>water sales revenue (operating costs)</p> <p>Bond sales (capital costs)</p>
Broughton Land Company	<p>Draft EA available March 5, 2008</p> <p>ITP September 18, 2008</p>	<p>-Bull trout</p> <p>-Snake River spring/summer Chinook salmon</p> <p>-Snake River fall Chinook salmon</p> <p>-Middle Columbia River steelhead trout</p> <p>-Snake River steelhead trout</p> <p>-5 unlisted</p>	Broughton Land Company (private)	<p>Watershed & forest management^{iv}</p> <p>Grazing^v</p> <p>Farming^{vi}</p> <p>Implementation of AMM terms</p>	<p>Invasion of exotic and toxic species</p> <p>Sedimentation and erosion</p> <p>Nutrient rich runoff</p> <p>Direct mortality</p>	<p>HR1, HR4, HR11</p> <p>ES2, ES3, ES4, ES5, ES6</p> <p>MZB3, MZB6</p>	<p>Private revenues; state and federal cost-share conservation programs; land rental revenues from the Conservation Reserve Enhancement Program and the Conservation</p>

⁸⁶ Aquatic management terms included only; terrestrial management terms omitted

HCP	Planning time	Species Covered species	ITP Holder (s)	Covered Activities	Key Stressors Streambank instability	Management Terms ⁸⁶	Funding Mechanism Reserve Program
Cedar River Watershed HCP	<p>NoI December 11, 1998</p> <p>Draft EA January 5, 1999</p> <p>ITP April 21, 2000</p> <p>16 months</p>	<ul style="list-style-type: none"> - Bull trout - Chinook salmon - Coho salmon - Pygmy whitefish - Sockeye salmon - Steelhead trout - Gray wolf - Grizzly bear - Bald eagle - Common loon - Marbled murrelet - Northern goshawk - Northern spotted owl - Peregrine falcon - 69 unlisted species 	The City of Seattle	<p>O&M of water system (<i>see EN i</i>) (Only City of Seattle O&M, does not apply to the impacts of activities by other public agencies or private parties)</p> <p>Watershed & forest management (<i>see EN iv</i>)</p> <p>Implementation of AMM terms</p> <p>Educational activities^{vii}</p>	<p>Habitat degradation</p> <p>Erosion</p> <p>Low flows</p>	<p>HH1</p> <p>HR4, HR5, HR8, HR9, HR11</p> <p>RF1, RF4</p> <p>DR1, DR3</p> <p>MZB1</p> <p>ES1, ES5, ES6 (commercial timber)</p> <p>OM1, OM3, OM5</p>	Discretionary funds

HCP	Planning time	Species Covered	ITP Holder (s)	Covered Activities	Key Stressors	Management Terms ⁸⁶	Funding Mechanism
City of Kent Clark Spring's Water Supply HCP	<p>NoI June 19, 2006</p> <p>DEIS available April 23, 2010</p> <p>Final EIS April 7, 2011</p> <p>ITP September 26, 2011</p> <p>About 5 years</p>	-Chinook salmon -Steelhead -Bull trout - 6 unlisted species	The City of Kent, Washington	O&M of water system (<i>See</i> EN i) Implementation of AMM terms O&M of augmentation system ^{viii} Incidental land management (<i>see</i> EN ii) Operation and maintenance of the Parshall Flume and USGS gaging station O&M of stormwater infrastructure ^{ix} Installation of monitoring wells	Habitat degradation Barriers to fish passage Disconnected rearing and flood protection habitat Wasteful water consumption	HH1, HH6, HR9, HR11, HR13, HR15 DR1 RF1 PO3, PO7 OM3, OM4, OM5	Discretionary funds including, but not limited to, revenues from water and land sales and from outside sources such as grants or contributions.

HCP	Planning time	Species Covered	ITP Holder (s)	Covered Activities	Key Stressors	Management Terms ⁸⁶	Funding Mechanism
Tacoma Water HCP	<p>Notice of public scoping for EIS August 21, 1998</p> <p>Application submitted December 23, 1999</p> <p>NoI January 20, 1999</p> <p>DEIS available January 14, 2000</p> <p>Final EIS January 5, 2001</p> <p>ITP issued July 6, 2001</p> <p>About 3 years</p>	<ul style="list-style-type: none"> - Chinook salmon - Bull trout - Oregon spotted frog - Gray wolf - Bald eagle - Marbled murrelet - Northern spotted owl - Grizzly bear - Canada lynx - Dolly Varden - 19 (13 aquatic) species of concern - 3 unlisted 	City of Tacoma, WA, Department of Public Utilities, Water Division	<p>O&M of water system (<i>see</i> EN i)</p> <p>Utilities system improvements^x</p> <p>Watershed & forest management (<i>see</i> EN iv) (based on the Green River Watershed Forest Land Management Plan)</p> <p>Implementation of AMM terms</p>	<p>Low flows</p> <p>Deteriorated habitat</p> <p>Fish passage barriers</p> <p>Erosion</p> <p>Added nutrients</p> <p>Noncontiguous habitat</p>	<p>HH1, HH11, HR, HR5, HR9, HR10, HR13, HR16</p> <p>SA4</p> <p>MZB2, MZB3, MZB7</p> <p>DR1</p> <p>RF2, RF3</p> <p>ES7</p> <p>PO1</p>	<p>The value of lost revenue is included as costs for some management items, such as the lost value of a tree used as LWD in streams or the opportunity costs of leaving riparian trees standing – these costs do not need to be funded.</p> <p>Cost-share with US Army Corps of Engineers – funds come from the discretion of the City of Tacoma (i.e. water, timber, and land sales)</p>
Green Diamond Resource Company California AHCP	<p>NoI July, 11, 2000</p> <p>DEIS August 16, 2002</p> <p>Final EIS November 27, 2006</p> <p>ITP</p>	<ul style="list-style-type: none"> - Chinook salmon - Coho salmon - Steelhead - Rainbow trout - Coastal cutthroat trout - tailed frog - Southern torrent salamander 	Green Diamond Resource Company	<p>Watershed & forest management (<i>see</i> EN iv)</p> <p>Rock pit construction and use</p> <p>Implementation of AMM terms</p>	<p>Sedimentation</p> <p>Flood plain management</p>	<p>DR1, DR6</p> <p>MZB1</p> <p>ES8</p> <p>PO1</p>	Privately funded

HCP	Planning time	Species Covered	ITP Holder (s)	Covered Activities	Key Stressors	Management Terms⁸⁶	Funding Mechanism
Storedahl Gravel Daybreak Mine Expansion & Habitat Enhancement Project HCP	<p>NoI December 27, 1999</p> <p>DEIS March 7, 2003</p> <p>Final EIS November 28, 2003</p> <p>ITP April 16, 2004</p> <p>4 years 4 month</p>	<ul style="list-style-type: none"> - Steelhead trout - Bull trout - chum salmon - Chinook salmon - Coho salmon - 5 unlisted species 	J.L. Storedahl & Sons, Inc. and Storedahl Properties LLC	<p>Gravel mining and related activities in the terrace above the 100-year floodplain^{xi}</p> <p>Gravel processing</p> <p>Implementation of AMM terms</p> <p>Monitoring and maintenance of conservation measures</p>	<p>Wetland/habitat degradation</p> <p>Low flows</p>	<ul style="list-style-type: none"> - Site Recreation - creation of emergent and open wetland habitat, riparian and valley-bottom forest restoration - habitat rehabilitation - riparian irrigation - low flow augmentation 	Privately funded
Washington Department of Natural Resources Low-Effect HCP for Commercial Geoduck Fishery	<p>Application received September 14, 2007</p> <p>Notice of Availability of proposed low effect HCP September 17, 2007</p> <p>ITP December 15, 2008</p>	<ul style="list-style-type: none"> - Chinook salmon - Chum salmon - Coastal cutthroat trout - Coho salmon - Pink salmon - Pacific herring - Steelhead - Southern resident orca - Pinto abalone - Olympia oyster - Bald eagle - California brown pelican - Marbled murrelet - Tufted puffin 	Washington Department of Natural Resources	Sub-tidal harvest of wild stock geoduck clams on state-owned aquatic lands for commercial, research and health sampling purposes	<p>Temporary habitat disturbance (turbulence and noise)</p> <p>Habitat contamination</p> <p>Direct mortality or harm</p>	<p>HR1, HR5, HR14,</p> <p>OM1, OM2</p>	Funded from revenue generated by the commercial geoduck fishery

HCP	Planning time	Species Covered	ITP Holder (s)	Covered Activities	Key Stressors	Management Terms ⁸⁶	Funding Mechanism
Washington Department of Natural Resources Forest Practices HCP	<p>NoI March 17, 2003</p> <p>DEIS February 11, 2005</p> <p>Final EIS January 27, 2006</p> <p>ITP June 5, 2006</p>	<ul style="list-style-type: none"> - Chinook salmon - Chum salmon - Sockeye salmon - Steelhead trout - Bull trout - 48 other unlisted fish and 7 amphibians 	The State of Washington	<p>Watershed & forest management (see EN iv)</p> <p>Road construction, maintenance, and abandonment (see EN iii)</p>	<p>Deteriorated habitats</p> <p>Erosion and sedimentation</p> <p>Unstable slopes/mass wasting</p> <p>Unstable</p>	<p>HH5, HH9, HH7</p> <p>HR4, HR9</p> <p>DR1</p> <p>MZB3, MZB8</p> <p>ES7, ES8, ES9</p> <p>OM4</p>	<p>Discretionary funds (?)</p> <p>Family Forest Fish Passage Program⁸⁷</p>
Balmorehea State Park Low-Effect HCP	<p>Draft HCP August 8, 2008</p> <p>ITP August 14, 2009</p>	<ul style="list-style-type: none"> - Comanche Springs pupfish - Pecos gambusia - 3 unlisted species 	Texas Parks and Wildlife Department	Normal management activities in the park	<p>Low flow</p> <p>Habitat degradation</p> <p>Contaminants</p>	<p>HH11</p> <p>HR1, HR3, HR4, HR6, HR7</p> <p>MZB1, MZB5</p> <p>ES9</p> <p>PO4</p>	N/A

⁸⁷ Cost-share for small landowners; pays 75-100% of HCP implementation costs

HCP	Planning time	Species Covered	ITP Holder (s)	Covered Activities	Key Stressors	Management Terms⁸⁶	Funding Mechanism
Edwards Aquifer Authority Recovery Implementation Program	<p>1st NOI February 17, 2000</p> <p>NOI March 5, 2010</p> <p>DEIS July 20, 2012</p> <p>Final EIS February 15, 2013</p> <p>ITP March 18, 2013</p> <p>3 years</p>	<ul style="list-style-type: none"> - Fountain darter - San Marcos salamander - San Marcos gambusia - Texas blind salamander - Comal Springs dryopid beetle - Comal Springs riffle beetle - Peck's Cave amphipod - Texas wild rice 	The Edwards Aquifer Authority; City of San Antonio (through its San Antonia Water System); City of San Marcos; City of New Braunfels; and Texas State University	<p>Regulation and use of the Aquifer^{xii}</p> <p>Recreational activities^{xiii}</p> <p>O&M of water system (less focus on supply, more on ecosystem management)</p> <p>Implementation of AMM terms</p>	<p>Low flow</p> <p>Degraded habitat</p> <p>Non-native vegetation</p>	<p>HH2, HH9</p> <p>HR1, HR3, HR7, HR11 HR12,</p> <p>SA7</p> <p>RF2</p> <p>DR2, DR4, DR5, DR7</p> <p>MZB4, MZB5, MZB6</p> <p>ES3, ES9</p> <p>PO2, PO3, PO4, PO5, PO8</p> <p>OM7</p>	<p>1. Aquifer management fees (AMF)</p> <p>2. Third-party contributions⁸⁸</p> <p>3. Potential for alternative funding</p>
El Coronado Ranch	<p>Draft EA January 5, 1998</p> <p>ITP April 17, 1998</p>	<ul style="list-style-type: none"> - Yaqui catfish - Yaqui chub - Yaqui longfin dace 	El Coronado Ranch and Cattle Company (Josiah and Valer Austin)	<p>Ranching management activities^{xiv}</p> <p>Grazing</p> <p>Implementation of AMM terms</p>	<p>Habitat degradation</p> <p>Invasive species</p>	<p>HR1</p> <p>SA1, SA5</p>	Private funds

⁸⁸ Funds provided by entities which do not directly use the Aquifer (and so do not pay AMFs) but benefit from the increased hydrologic stability which the HCP provides. These funds are guaranteed by a number of entities throughout the duration of the permit.

HCP	Planning time	Species Covered	ITP Holder (s)	Covered Activities	Key Stressors	Management Terms ⁸⁶	Funding Mechanism
Lower Colorado River MSCP	<p>NOI May 18, 1999 (supp. July 12, 2000)</p> <p>DEIS June 18, 2004</p> <p>Final EIS December 17, 2004</p> <p>ITP April 4, 2005</p> <p>5 years</p>	<p>- Yuma clapper rail</p> <p>- Southwestern willow flycatcher</p> <p>- Desert tortoise</p> <p>- Bonytail</p> <p>- Humpback chub</p> <p>- Razorback sucker</p> <p>- Yellow billed cuckoo</p> <p>- Relict leopard frog</p> <p>- 19 unlisted species</p>	Lower Colorado River Multi-Species Conservation Program ⁸⁹	<p>O&M of water system (<i>see EN i</i>)</p> <p>Hydropower</p> <p>Implementation of AMM terms</p>	<p>Habitat loss/degradation</p> <p>Low flow</p> <p>Direct mortality</p>	<p>HH3, HH10</p> <p>SA1, SA2,</p> <p>MZB7</p> <p>OM2, OM3, OM5</p>	Water and Power agencies from Arizona, California, and Nevada commit to share the estimated cost of LCR MSCP with the Federal government on a 50/50 ratio. California will pay 50% of the non-federal mandated cost while Arizona and Nevada will pay 25% each.

⁸⁹ **Arizona:** Arizona Department of Water Resources, Arizona Electrical Power Cooperative Inc., Arizona Game and Fish Department, Arizona Power Authority, Central Arizona Water Conservation District, Cibola Valley Irrigation and Drainage District, City of Bullhead, City of Lake Havasu, City of Mesa, City of Somerton, City of Yuma, Arizona Electrical District No. 3, Pinal County, the Golden Shores Water Drainage District, the Mohave County water authority, Mohave Valley irrigation and drainage district, the Town of Fredonia, Town of Thatcher, Town of Wickenburg, Salt River Project Agricultural Improvement and Power District, the Unit “B” Irrigation and Water Users’ Association, the Yuma Irrigation District, and the Yuma Mesa Irrigation and Drainage district
California: The Bard Water District, City of Needles, Coachella Valley Water District, Colorado River Board of California, the Imperial Irrigation District, LA Department of water and power, Palo Verde Irrigation District, Dan Diego County Water Authority, Southern California Edison Company, the Southern California Public Power Authority, and the Metro Water District of Southern California.
Nevada: The Basic Water Company, the Colorado River Commission of Nevada, the Nevada Department of Wildlife, and the Southern Nevada Water Authority

HCP	Planning time	Species Covered	ITP Holder (s)	Covered Activities	Key Stressors	Management Terms ⁸⁶	Funding Mechanism
Malpai Borderlands HCP (according to draft)	<p>Application submitted September 27, 2006</p> <p>Draft EA July 2, 2007</p> <p>ITP September 11, 2008</p> <p>23 months</p>	<ul style="list-style-type: none"> - Yaqui catfish - Yaqui chub - Northern aplomado falcon - Chiricahua leopard frog - Mexican spotted owl - New Mexican ridge-nosed rattlesnake - Beautiful shiner - Gila topminnow - Huachauca water-umbel - 10 unlisted species 	<p>Malpai Borderlands Group (nonprofit coalition of conservation minded ranchers who own land in the Malpai Borderlands)</p> <p>IA signers, but not ITP holders: New Mexico Department of Game and Fish; New Mexico State Lands Office; Arizona Game and Fish Department; Arizona State Land Department; Natural Resources Conservation Service</p>	<p>Grassland Management^{xv}</p> <p>Ranching Management Activities (<i>See</i> EN xiv)</p> <p>Implementation of AMM terms</p>	<p>Erosion</p> <p>Temporary habitat degradation</p> <p>Direct mortality</p>	<p>DR1, DR10</p> <p>MZB6</p> <p>PO6</p>	<p>Tax-exempt contributions and grants from public agencies and private foundations – fund all administrative work</p> <p>Participating ranchers will be responsible for the costs of implementing voluntary measures that are not satisfied by other funding mechanisms</p>

HCP	Planning time	Species Covered	ITP Holder (s)	Covered Activities	Key Stressors	Management Terms⁸⁶	Funding Mechanism
Salt River Project Horseshoe and Bartlett HCP	<p>NoI June 19, 2003</p> <p>DEIS July 25, 2007</p> <p>Final EIS April 30, 2008</p> <p>ITP May 30, 2008</p> <p>4 years 11 months</p>	<ul style="list-style-type: none"> - Southwestern willow flycatcher - Razorback sucker - Colorado pikeminnow - Gila topminnow - Spikedace - Loach minnow - 10 unlisted species 	The Salt River Project	<p>Continued operation by SRP of 2 reservoirs on the Verde River in Arizona</p> <p>Implementation of AMM terms</p>	<p>Low instream flows</p> <p>habitat destruction</p> <p>nonnative fish (predation, competition, and alteration of habitat)</p>	<p>Optimum Operation Alternative (HR1, SA1, SA2, SA3, SA7)</p> <p>OM5</p>	Established an irrevocable trust, privately funded by SRP
Salt River Project Roosevelt Lake HCP	<p>NoI August 29, 2001</p> <p>DEIS August 19, 2002</p> <p>Final EIS November 29, 2002</p> <p>ITP February 26, 2003</p> <p>1 y 6 m</p>	<ul style="list-style-type: none"> - Yuma clapper rail - Southwestern willow flycatcher - 2 unlisted species 	Salt River Project	<p>Continued operation of Roosevelt by SRP</p> <p>Implementation of AMM terms</p>	<p>Habitat destruction</p> <p>Direct mortality</p>	OM1, OM2, OM3, OM4, OM5	SRP privately funded
City of Adrian HCP	<p>Application for ITP September 5, 2007</p> <p>ITP January 11, 2008</p>	<ul style="list-style-type: none"> - Topeka shiner 	City of Adrian	Groundwater pumping	Low stream flow	HR13	Discretionary funds

HCP	Planning time	Species Covered	ITP Holder (s)	Covered Activities	Key Stressors	Management Terms⁸⁶	Funding Mechanism
Exelon Low Effect HCP	<p>Draft HCP January 25, 2008</p> <p>ITP August 16, 2010</p>	<p>- Higgens eye pearlymussel</p> <p>- Sheepnose mussel</p>	Exelon Generation Company, LLC	<p>Alternative Thermal Standard discharge of cooling water</p> <p>Maintenance Dredging</p> <p>Edison Pier Removal</p>	<p>Increases to river water temps</p> <p>Direct mortality</p>	<p>SA2, SA3, SA6, SA7</p> <p>DR3, DR8</p>	Privately funded
NiSoure MSHCP	<p>NoI October 11, 2007</p> <p>DEIS July 13, 2011</p> <p>Final EIS June 6, 2013</p> <p>ITP November 14, 2013 6 y 1 m 73 months</p>	42 species; take is requested of: Indiana bat, bog turtle, clubshell, fanshell, Northern riffelshell, James spinymussel, Nashville crayfish, Madison cave isopod, American burying beetle and sheepnose mussel)	NiSource and its subsidiaries (Columbia Gas Transmillion, LLC; Columbia Gulf Transmission LLC; Crossroads Pipeline Company; Central Kentucky Transmission company; and NiSource Gas Transmission and Storage Company)	<p>Non-earth disturbing operations and maintenance of pipelines</p> <p>Safety-related repairs, replacements, and maintenance</p> <p>Certain expansion activities</p> <p>Capital projects^{xvi}</p>	<p>Habitat destruction/ degradation</p> <p>Loss of habitat connectivity</p> <p>Disease and parasites</p> <p>Direct mortality</p> <p>Invasive species</p> <p>Altered hydrology</p>	<p>HH1</p> <p>H2, HR4, HR11, HR14</p> <p>SA1, SA2, SA4, SA6</p> <p>DR1, DR3, DR9</p> <p>MZB1, MZB3, MBZ7</p> <p>ES7</p> <p>PO1, PO7</p> <p>OM1, OM2, OM4, OM5</p>	<p>Mitigation and adaptive management costs are covered in a trust fund and emergency fund</p> <p>All other costs will be assured through a NiSource corporate credit facility or Service approved letter of credit</p>

HCP	Planning time	Species Covered	ITP Holder (s)	Covered Activities	Key Stressors	Management Terms⁸⁶	Funding Mechanism
Montana Department of Natural Resources and Conservation Forested State Trust Lands HCP	<p>NoI April 26, 2003</p> <p>DEIS June 26, 2009</p> <p>Final EIS September 17, 2010</p> <p>ITP December 13, 2011</p>	<ul style="list-style-type: none"> - Bull trout - Grizzly bear - Canada lynx - 2 additional unlisted aquatic 	Montana DNRC	<p>Watershed & forest management (<i>see</i> EN iv)</p> <p>O&M of Roads (<i>see</i> EN iii)</p> <p>Grazing (<i>see</i> EN v)</p> <p>Implementation Activities</p>	<p>Temperature</p> <p>sedimentation/contaminants</p> <p>Habitat degradation</p> <p>Channel instability, form and function</p>	<p>HH1, HH7</p> <p>SA6</p> <p>RF1</p> <p>DR1</p> <p>MZB1, MZB3, MZB6</p> <p>ES1, ES4, ES5, ES6, ES8</p>	DNRC has adapted the procedures within the HCP to the maximum extent possible to allow implementation within the current budget. Additional funding for tasks such as road
Plum Creek Native Fish HCP	<p>NoI December 12, 1997</p> <p>DEIS December 17, 1999</p> <p>Final EIS September 21, 2000</p> <p>ITP November 23, 2000</p> <p>2 years 11 months</p>	<ul style="list-style-type: none"> - bull trout - Snake River steelhead evolutionarily significant unit - Mid-Columbia River steelhead ESU - Lower-Columbia River steelhead ESU - Snake River spring/summer chinook salmon ESU - Snake River fall chinook salmon ESU - Lower Columbia River chinook salmon ESU - Columbia River chum salmon ESU 	Plum Creek Timberlands, L.P.	<p>Watershed & forest management (<i>see</i> EN iv)</p> <p>Grazing (<i>see</i> EN v)</p> <p>Permitting</p> <p>Implementation of AMM terms</p>	<p>Erosion</p> <p>Sedimentation</p> <p>Chemical runoff</p> <p>Habitat connectivity</p> <p>Bank instability erosion,</p> <p>Degraded habitat (temperature & vegetation)</p>	<p>HR1, HR3, HR4, HR8, HR9, HR11</p> <p>DR1</p> <p>MZB1, MZB3, MZB6</p> <p>ES1, ES8</p> <p>OM4</p>	Privately funded

HCP	Planning time	Species Covered	ITP Holder (s)	Covered Activities	Key Stressors	Management Terms ⁸⁶	Funding Mechanism
		- 9 unlisted fish					
Coachella Valley Multi-species HCP	<p>NoI June 28, 2000</p> <p>DEIS November 5, 2004</p> <p>Final EIS April 21, 2006</p> <p>Supplement to Final EIS March 20, 2007</p> <p>ITP October 1, 2008</p> <p>8 yrs 4 months</p>	<ul style="list-style-type: none"> - Southwestern willow flycatcher - Coachella Valley fringe-toed lizard - Coachella Valley milk-vetch - Triple-ribbed milk –vetch - Desert pupfish - Yuma clapper rail - Peninsular bighorn sheep - Arroyo toad - Desert tortoise - Least Bell’s vireo - 17 unlisted species 	<p>Riverside County, cities of Cathedral, Coachella, Indian Wells, Indio, La Quinta, Palm Desert, Palm Springs, Rancho Mirage, as well as Coachella Valley Water District, Imperial Irrigation District, Coachella Valley Association of Governments and Caltrans,</p>	<p>Development permitted or approved by ITP holders</p> <p>Public facility construction, operations, maintenance and safety activities</p> <p>Emergency response activities by Permittees required to protect the public health, safety, and welfare</p>	<p>Habitat destruction</p> <p>Poor drainage</p> <p>Contaminants</p> <p>Light pollution</p> <p>Noise pollution</p> <p>Invasives</p> <p>Erosion</p>	<p>HH12</p> <p>HR17</p> <p>DR1, DR7</p> <p>MZB1, MZB9</p> <p>ES7</p> <p>OM1, OM2</p>	<ul style="list-style-type: none"> - Local development mitigation fees - Fees on the importation of waste into landfills in Riverside County (\$1/ton) - ½ cent sales tax to provide funds for transportation project mitigation - Mitigation for regional infrastructure projects - Landfill Mitigation Trust Fund - Endowment funds - Interest collected

HCP	Planning time	Species Covered	ITP Holder (s)	Covered Activities	Key Stressors	Management Terms ⁸⁶	Funding Mechanism
East Bay Municipal Utility District Low-Impact HCP	Notice of Availability May 16, 2008	- California red-legged frog - Pallid Manzanita - Central Valley CA steelhead - Santa Cruz tarplant - Alameda whipsnake - 1 unlisted species	East Bay Municipal Utility District	Watershed & forest Management (<i>see</i> EN iv) Grazing (<i>see</i> EN v) Farming (<i>see</i> EN vi) Recreation (<i>see</i> EN xiii)	Erosion Habitat degradation Contaminants Invasives	HH7 HR1, HR3, HR4, HR5, HR8, HR9, HR11 SA4, SA6 DR1, DR3, DR10 MZB1, MZB2, MZB6, MZB10 ES1, ES3, ES4, ES5, ES6, ES7, ES8, ES9 PO1, PO7	Privately funded
Fruit Growers Supply Company	NoI to produce EIS February 22, 2008 DEIS November 13, 2009 Final EIS June 22, 2012 ITP issued November 28, 2012 4 years 9 months	- Northern spotted owl - Yreka phlox - Coho salmon ESU - 3 unlisted species	Fruit Growers Supply Company	Watershed & forest management (EN iv) Road O&M (EN iii) Rock quarry and borrow pit O&M Implementation of AMM terms	Low instream flows, Erosion Sedimentation loading	HH11 DR1 MZB1, MZB3, MZB7, MZB10 ES7, ES8,	Private funding

HCP	Planning time	Species Covered	ITP Holder (s)	Covered Activities	Key Stressors	Management Terms ⁸⁶	Funding Mechanism
Newhall Farm Seasonal Crossings low effect HCP	ITP issued September 17, 2004	- California red-legged frog - Unarmored threespine stickleback - 3 unlisted species	Newhall Land and Farming Company	Crossing installation and removal	Habitat destruction, channelization, urbanization, water quality	DR1	Private funding

ⁱ **O&M water system** activities include, but are not limited to, reservoir storage and regulation; diversion/withdrawal of water for water supply; alterations of flows via dams for water supply; water release from dams to regulate depth, turbidity, and temperature of habitat water; debris removal; operation of boats and barges on reservoirs; general landscape maintenance; well construction; installing fences and security; delivery, storage, and application of chemicals used for water supply treatment

ⁱⁱ **Incidental land management** activities include management of city owned riparian lands; maintenance and repair of easements and rights of ways; O&M of covered facilities, open areas, & service roads; clearing/trimming for fence, power, and telephone lines associated with covered facilities

ⁱⁱⁱ **Road O&M** activities include excavating and depositing soil or rock to form a road prism (an area consisting of the road surfaces and any cut slope and road fill); establishing ditches, culverts and waterbars to manage surface water; installing culverts, bridges or fords; widening, realigning, or modification of existing roads; surfacing; grading; erosion control measures; brush control; ditch clearing and drainage

^{iv} **Watershed and forest management** activities include felling and bucking timber; log transportation; salvaging timber products; helicopter operations; road/culvert construction, maintenance, & decommissioning; site preparations and slash abatement; tree planting; fertilization of certain timber stands with strict application details, silvicultural thinning of timber stands and regeneration harvests; prescribed or wildfires; stream and riparian area enhancement projects; watershed patrol and inspection; equipment maintenance and use; operation of reservoirs or gating systems

^v **Grazing** activities include normal grazing, pasture rotation, and herd dispersion practices; fence, gate and cattle guard construction and repair; feeding operations; construction or repair of associated properties/facilities, watering devices, and corrals; collection and removal of waste and dead animals

^{vi} **Farming** activities include normal plowing tillage and cultivation; planting, fertilizing, and land application of manure; harvesting of crops; mowing; burning of weeds, grass, and stubble; fence construction and maintenance; road construction and maintenance; occasional or emergency use of existing fords; construction and maintenance of pumping and water storage facilities; normal irrigation practices as described for area; ditch construction, cleaning and maintenance; fallow treatment

^{vii} Includes operations of facilities; conducting educational and cultural management programs, providing such programs do not materially increase the level of take allotted in permit; employee training

^{viii} Including replacement, monitoring, improvements, relocation of system, and relocation of infrastructure as needed

^{ix} **Stormwater** activities include O&M of roadside ditches, on-site infiltration system, roadway culvert crossings

^x **Water system improvements:** Raising of the existing diversion dam by approx. 6.5 feet, which will extend the inundation pool to 2,570 feet upstream of the Headworks division; realignment and enlargement of existing intake and adding upgraded fish screens and bypass facilities for downstream passage; reshaping of the Green River channel downstream of the existing diversion to accommodate the installation of an efficient trap-and-haul facility for upstream fish passage; instillation of trap-and-haul facility; installation, monitoring and maintenance of the instream structures in the impoundment as fisheries mitigation for the Headworks modification

^{xi} Those which have potential impacts on ground and surface water quality and quantity, channel migration, and potential access to gravel ponds by anadromous salmonids

^{xii} **Regulatory and Operational use of the Aquifer:** permits for groundwater withdrawals and recharge, storage and recovery program

^{xiii} **Recreation** activities include tubing; wading pools; non-motorized vessels; hiking; public access or outfitting services

^{xiv} **Ranching management** activities include diversion of water; operation and maintenance of existing structures, conveyance systems, and stock-watering ponds; use of water management facilities for cattle and for the rearing and maintenance of Plan Species; corridor grading and preparation for fencelines; ground surface disturbances required for trench construction and digging of post-holes and utility poles for fencelines, waterlines, and utility lines; all associated vehicle uses in the immediate vicinity of the fence or water line; other associated or incidental activities necessary to these tasks

^{xv} **Grassland management** activities include fire Management (prescribed fires and wildfires); mechanical brush control (roller-choppers, grubbing, bulldozing, & chaining)

^{xvi} Construction of pipelines, storage wells, general appurtenance and cathodic protections; compression-related facilities; communication facilities; access road O&M

Appendix B - Management Terms Key

Habitat			Management Terms				Public Outreach (PO)	Offsite mitigation (OM)
Hydrologic Habitat (HH)	Habitat Restoration (HR)	Species Augmentation (SA)	Regulated Flows (RF)	Development Regulations (DR)	Management zones/BMPs (MZB)	Erosion/Sedimentation (ES)		
HH1 Flow Augmentation/ regulation	HR1 Exotic removal/ management	SA1 Hatchery and rearing of covered species for reintroduction	RF1 Minimum flow requirements	DR1 Culvert/water crossing requirements	MZB1 Riparian zones and/or buffers	ES1 Drain and seed abandoned roads	PO1 Employee awareness classes	OM1 Offsite habitat rehabilitation
HH2 Aquifer storage and recovery	HR2 Spawning gravel placement	SA2 Hatchery and rearing of covered species for genetic variation as needed	RF2 Mandated water withdrawal reductions as needed	DR2 Designation of access points	MZB2 Fish screens and/or bypass facilities	ES2 Rock surfacing	PO2 Voluntary irrigation suspension program	OM2 Offsite habitat construction
HH3 Establishment and maintenance of backwater	HR3 Aquatic vegetation restoration	SA3 Native species stocking	RF3 Water use restrictions as needed	DR3 Equipment exclusion/ cleaning measures	MZB3 Harvest zones (No harvest/limited harvest/open harvest)	ES3 Installation of sediment ponds/traps	PO3 Water conservation measures	OM3 Fund 3 rd party mitigation/research
HH4 Temperature management	HR4 Channel/shoreline stabilization/reconstruction	SA4 Transport and release of juveniles	RF4 Flow downramping	DR4 Hazardous material ban	MZB4 Low impact development zones	ES4 Seed logged slopes	PO4 Household hazardous waste program	OM4 Riparian easements
HH5 Wetland improvements/protection/ creation	HR5 Construction & maintenance of fish passage facilities	SA5 Emergency evacuation in severe drought		DR5 Septic System registration	MZB5 Golf course management	ES5 Channel vegetation	PO5 Diving classes (educational)	OM5 Land acquisition
HH6 Channel reconstruction (increase depth)	HR6 Decaying vegetation removal	SA6 Species relocation		DR6 Water drafting restrictions	MZB6 Grazing BMPs (riparian buffers, field isolation, pasture rotation, grassed waterways)	ES6 Elimination of activity (farming, grazing, or timber harvest) in severely damaged areas	PO6 Recruitment of sub-applicants	OM6 Water rights acquisition
HH7 Disconnect road drainage from stream	HR7 Litter/floating vegetation management	SA7 Hatchery and rearing facility for research		DR7 Impervious surface/water quality protections	MZB7 Land retention/ preservation	ES7 Slope/grading guidelines	PO7 Public education	OM7 Offsite refugia of native plants
HH8 Reservoir operations	HR8 Log jams			DR8 Diffuser pipe/ discharge coolant away from habitat	MZB8 Landslide avoidance plans	ES8 Road construction guidelines	PO8 Recreation guidelines	
HH9 Surface water diversions	HR9 Placement of large woody debris	HR14 Removal of contaminants/debris		DR9 Infrastructure based on habitat connectivity	MZB9 BMP for development (time construction to avoid peak points of vulnerability)	ES9 Sedimentation removal		
HH10 Marsh pumping	HR10 Mainstream gravel nourishment	HR15 Beaver trapping and removal		DR10 Species surveys on private land	MZB10 Forestry BMPs (retain LWD, no increased sed, no decrease in channel stability or fish passage)			
HH11	HR11	HR16						

Guaranteed flow maintenance	Planting of native grass, brush, and/or trees	Isolation from noise, light, and trespassing						
HH12 Stormwater design	HR12 Sandbar removal							
HH13 Installation of snow pillows	HR13 Off-channel habitat creation/connection							