FINAL
COMAL COUNTY
REGIONAL HABITAT CONSERVATION PLAN

Prepared for

Comal County, Texas

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EXECUTIVE SUMMARY

INTRODUCTION

Over the next 30 years, the population of Comal County, Texas, is expected to grow to 202,500, a 78 percent increase. As the population grows, native woodlands will increasingly be converted to urban and suburban landscapes. In addition to loss of open space, increased land development in the County is likely to cause the loss and disturbance of habitat used by species protected under the Federal Endangered Species Act of 1973, as amended, 16 USC § 1531 et seq. (ESA). Compliance with the ESA can be costly and time-consuming for individual landowners. In the face of these growth-related challenges, the Comal County Commissioners Court and a citizens advisory committee have investigated ways to protect and preserve open space for the benefit of the County's citizens, to conserve the County's endangered species, and to help landowners and other entities comply with the ESA as efficiently and cost-effectively as possible. The Comal County Commissioners Court has determined that progress toward these goals will best be achieved by development and implementation of a Regional Habitat Conservation Plan (RHCP) with voluntary landowner participation.

A Habitat Conservation Plan (HCP) is a tool by which a non-Federal entity may obtain authorization under the ESA to conduct activities such as land development that might otherwise cause the unlawful "take"[1] of species listed as threatened or endangered under the ESA. An HCP (or in this case a countywide, or regional, HCP) specifies conservation measures that will be implemented in exchange for a section 10(a)(1)(B) permit from the U.S. Fish and Wildlife Service (Service) that allows a specified level of incidental take of listed species. "Incidental take" is take of any federally listed wildlife species that is incidental to, but not the purpose of, otherwise lawful activities (ESA section 10(a)(1)(B)). In this RHCP, incidental take is expressed as the number of acres of potential Covered Species habitat that will be impacted by covered activities. This approach is supported by case law (Oregon Natural Resources Council v. Allen, 476 F.3d 1031, 1037 (9th Cir. 2007) and Ariz. Cattle Growers' Ass'n v. U.S. Fish and Wildlife Service, 273 F.3d 1229, 1249-50 (9th Cir. 2001)). At this time, three other Texas counties (Travis, Williamson, and Hays) have developed or are in the process of developing RHCPs to preserve open space, protect endangered species, and streamline ESA compliance for economic development.

Two categories of species are addressed in the Comal County RHCP: "Covered Species" and "Evaluation Species." The Covered Species are the golden-cheeked warbler (*Dendroica chrysoparia*) and black-capped vireo (*Vireo atricapilla*), the two federally listed species to be included on and covered by the requested section 10(a)(1)(B) incidental take permit (Permit).

Potential golden-cheeked warbler habitat in the County (see Figure ES-1) consists of an estimated 65,581 acres[2] (26,540 hectares) of native woodlands that contain a mixture of mature Ashe juniper (*Juniperus ashei*) and hardwoods such as plateau live oak (*Quercus fusiformis*),

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[1] "Take," as defined by the ESA, means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct" (16 USC § 1532(19)).

[2] The entire County land mass consists of 359,328 acres (145,415 hectares).

Texas red oak (*Q. buckleyi*), shin oak (*Q. sinuata* var. *breviloba*), escarpment black cherry (*Prunus serotina* var. *eximia*), Arizona black walnut (*Juglans major*), cedar elm (*Ulmus crassifolia*), and Texas ash (*Fraxinus texensis*). Immature juniper (cedar) thickets are not golden-cheeked warbler habitat and will not be the object of preservation under this RHCP, nor will they be considered in estimates of incidental take. A description of habitat types that are likely to be used by golden-cheeked warblers is available from the Texas Parks and Wildlife Department (TPWD 2006).

Potential black-capped vireo habitat, which is rare in Comal County (perhaps less than 1,000 acres [405 hectares]), is characterized by early successional, semi-open shrubland that often occurs after disturbances such as fire. Black-capped vireo habitat is not shown in Figure ES-1 because it is scarce in Comal County and because it is difficult to identify using aerial photography.

The "Evaluation Species" are not presently listed and will not be covered by the Permit. These species are, however, either currently suggested to be listed in citizens' petitions to the Service or are sufficiently rare and/or threatened within the County that a reasonable possibility exists that they will be considered for listing during the Permit term. The Evaluation Species addressed in this document, but which will not be covered by the Permit, include the following: Cagle's map turtle (*Graptemys caglei*), a cave-obligate decapod (*Palaemonetes holthuisi*), two cave-obligate amphipods (*Seborgia hershleri* and *Texiweckelia relicta*), a cave-obligate beetle (*Rhadine insolita*), a cave-obligate harvestman (*Texella brevidenta*), two cave-obligate spiders (*Cicurina puentecilla* and *Cicurina reclusa*), and a snail (the nymph trumpet; *Phreatoceras taylori*).

The Comal County RHCP includes conservation measures that may benefit some or all of the Evaluation Species and may help preclude the need to list them. Such conservation measures may also help facilitate obtaining incidental take coverage if these species become listed in the future and coverage for take is needed. Should any of the Evaluation Species become federally listed in the future, they would only be covered by the requested Permit if the County applies for and the Service grants a major amendment to the Permit.

Species not addressed in this RHCP include the listed aquatic species associated with the Edwards Aquifer (aquifer species) that occur in Comal County—fountain darter (*Etheostoma fonticola*), Peck's cave amphipod (*Stygobromus pecki*), Comal Springs riffle beetle (*Heterelmis comalensis*), Comal Springs dryopid beetle, and (*Stygoparnus comalensis*). They are not included in the RHCP nor is the County seeking incidental take authorization for these species for the reasons listed below.

1. It is not expected that the covered actions will cause take of the aquifer species because several regulations are in place to prevent, or reduce to the greatest extent practicable, adverse impacts to the groundwater resources upon which these species depend. Regulations include the Edwards Aquifer Rules (30 Texas Administrative Code, Chapter 213); Texas state water quality standards for streams, effluent, and drinking water; the Texas Pollution Discharge Elimination System permitting program; the City of New Braunfels' drainage and erosion control ordinances; and the Edwards Aquifer Authority's groundwater pumping regulations.

Figure ES-1

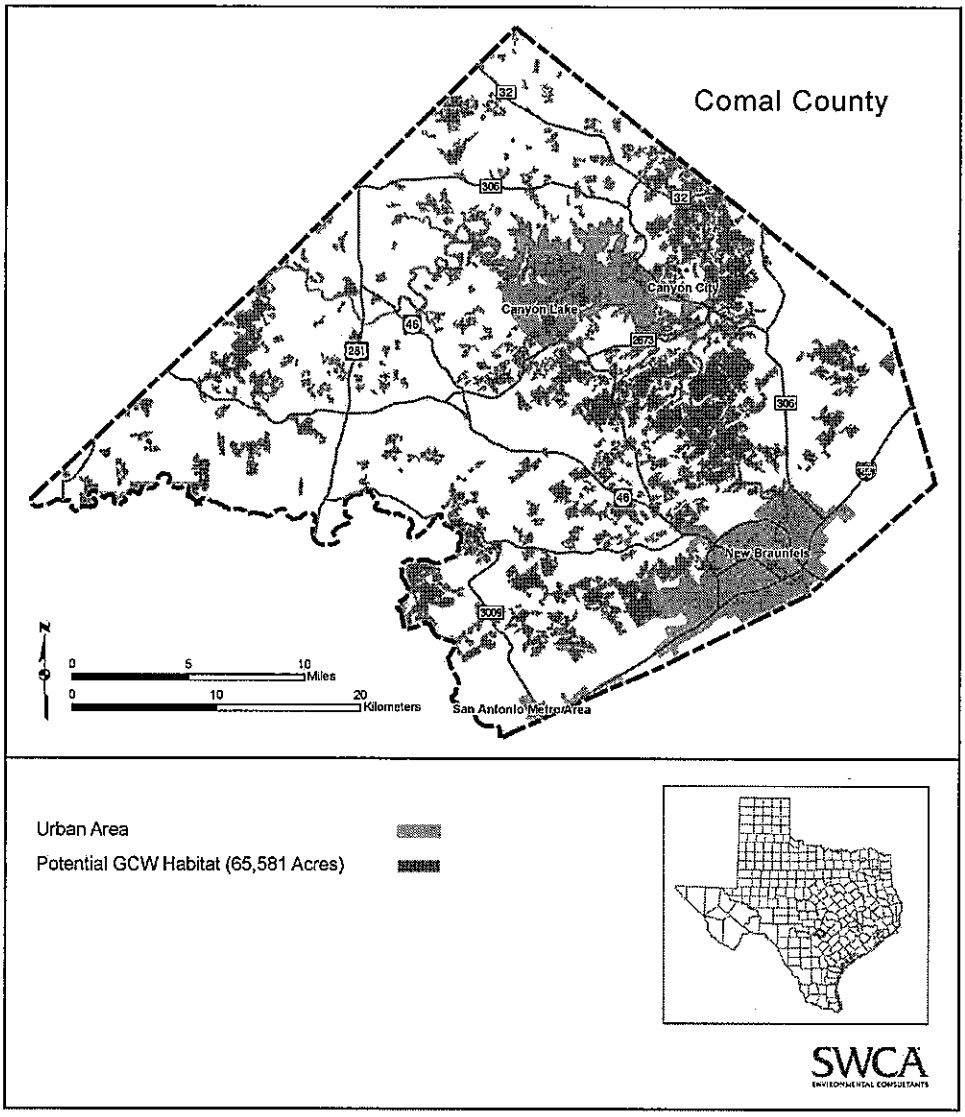

Figure ES-1. Distribution of potential golden-cheeked warbler (GCW) habitat in patches larger than 11 acres in Comal County, Texas.

The Edwards Aquifer Authority is also working closely with the Service and numerous stakeholders through the Edward Aquifer Recovery Implementation Program created by the Texas Legislature with the express goal of contributing to the recovery of the aquifer species.

2. Texas Legislature has allowed counties little if any authority to control impacts to aquatic resources. Instead, the Legislature has made the Texas Commission on Environmental Quality (TCEQ) the primary protector of water quality within the state, and the TCEQ has developed, with the Service's approval, the Optional Enhanced Measures for the Protection of Water Quality in the Edwards Aquifer (TCEQ 2007). The Service has expressed its opinion that these measures are sufficient to avoid "take" of key aquatic species. The County is committing to making each RHCP participant aware of the Optional Measures and to encourage utilization of these measures wherever applicable and practicable.

3. Even if issuance of the requested permit were to affect the aquifer species, which is not expected, levels of take would be difficult to substantiate or quantify. The County, therefore, has elected to focus on take avoidance rather than take authorization by declining to allow participation in the RHCP until a project proponent has demonstrated adherence to all TCEQ water resource protection regulations or has certified to the County, in writing, that the project participant will adhere to all relevant laws and regulations, including those related to water resource protection. In addition, the County will encourage participants to utilize the Optional Enhanced Measures as stated above.

These points are discussed at greater length in Chapter 1, Section 1.1.1.2 of this document.

PURPOSES OF THE RHCP

The primary purposes of the Comal County RHCP are to:

1. contribute to and facilitate the conservation of the Covered Species while preserving open space in the County;
2. help conserve and obtain information about the Evaluation Species and provide that information to the Service; and
3. provide the affected landowners of Comal County a more efficient process for complying with the ESA compared to individual permitting and consultation processes with the Service.

This RHCP will provide landowners with a means to develop their property in compliance with the ESA with less processing cost and time than the individual permit process requires. Moreover, a secondary benefit of the RHCP will be the preservation of natural open space in the County at a lower cost to taxpayers than would be likely without an RHCP.

The incidental take of endangered species covered by this RHCP may be authorized under and in accordance with this RHCP for the following otherwise lawful activities: road construction, maintenance, and improvement projects; utility installation and maintenance, including but not limited to power and cable lines; water, sewer, and natural gas pipelines; construction of plants

and other facilities; school development or improvement projects; and public and private construction and development. It should be noted that this RHCP is not intended to restrict or address ordinary farm and ranching practices or juniper (i.e., cedar) removal programs; however, participation in the RHCP may be granted for brush control programs that are determined to potentially impact Covered Species habitat.

The RHCP describes the following:

- The amount of listed species habitat in Comal County that will be disturbed by RHCP participants over the 30-year life of the RHCP and the amount of incidental take of golden-cheeked warbler and black-capped vireo covered by the requested Permit.
- The conservation measures that will be implemented to minimize and mitigate the impacts to the Covered Species.
- Procedures for participation in the RHCP.
- Strategies for acquiring preserves.
- A funding plan for RHCP implementation.

These topics are summarized in the following text and in Table ES-1.

ANTICIPATED IMPACTS (TAKE) AND MITIGATION

Anticipated Take. Development in the County over the next 30 years is projected to result in direct and indirect impacts to up to 10,476 acres (4,239 hectares) of golden-cheeked warbler habitat. At an RHCP participation rate of 20 to 50 percent, the amount of development covered by the RHCP is anticipated to be from 2,095 to 5,238 acres (848–2,120 hectares). The County is basing its calculations in the RHCP on the high end of that range (a participation rate of 50 percent), and is therefore requesting a Permit to cover the incidental take associated with the loss of 5,238 acres of golden-cheeked warbler habitat over the 30-year life of the RHCP. The rationale for assuming this level of RHCP participation is provided in Chapter 3, Section 3.1 of this document.

Under this RHCP, take for the golden-cheeked warbler will be authorized only when the County has acquired sufficient mitigation credits[3] to cover the take. The mitigation ratio (acres of habitat preserved to acres impacted) will typically be 1:1. This ratio is justified because mitigation habitat 1) will be in larger patches (500-acre [202-hectare] minimum) than the impacted habitat, which is likely to be 10 to 250 acres (4 to 101 hectares) in size; 2) will be selected for its high quality; and 3) will be protected and managed for golden-cheeked warblers in perpetuity. Indirect impacts (impacts that occur in golden-cheeked warbler habitat adjacent to destroyed or modified habitat) will be assessed at 50 percent of the value of direct impacts for a distance of 300 feet (91 meters) from the edge of the direct impacts.

[3] The terms "mitigation credit" and "conservation credit" are used interchangeably in this document. "Participation fee" refers to the cost of one mitigation credit purchased by an RHCP participant.

Table ES-1. Summary of the Comal County RHCP anticipated take and mitigation for the Covered Species, and conservation measures for the Evaluation Species.

Species	How Level of Take Determined	Estimated Impact and Take Over Life of RHCP	Participation Fee Structure (i.e., Cost Per Conservation Credit)	Mitigation or Conservation Measures
Golden-cheeked Warbler	Based on acres of impact to known and potential habitat patches. Potential impacts will be verified with on-site habitat assessments performed by qualified biologists and will be based on habitat descriptions provided by the TPWD, presence/absence surveys, and/or breeding bird surveys.	Acres of direct and indirect impact: 2,095–5,238 acres[1] Permitted incidental take request: 5,238 acres	Starting at $7,500/acre for impacted golden-cheeked warbler habitat paid by RHCP participants.	Mitigate for impacts to 5,238 acres of habitat by establishing an estimated 6,548 acres[2] of preserve(s)/ conservation bank(s) in the County, normally at a mitigation-to-take ratio of 1:1, but up to 3:1 in some instances. Or mitigate through the purchase of credits from other Service-approved conservation banks whose service areas include Comal County. County will manage all County-owned preserves and could manage conservation banks based on conservation easements in agreements with landowners.
Black-capped Vireo	Same as for golden-cheeked warbler	Acres of direct and indirect impact and permitted incidental take request: 1,000 acres	When credits are available, the County will charge cost plus override.	Acquire credits from a Service-approved conservation bank; acquire, preserve, and manage in perpetuity black-capped vireo habitat within the County; and acknowledge black-capped vireo conservation bank credits owned by a potential participant and used for the purposes of providing mitigation in exchange for participation in the RHCP. Impacts to black-capped vireo habitat would be primarily mitigated at a 1:1 mitigation-to-take ratio (up to 2:1 in some instances).
Evaluation Species	N.A.	N.A.	N.A.	Mitigation measures for Covered Species likely to benefit some or all Evaluation Species. Fund and manage research and public awareness programs. Periodically evaluate effect of beneficial actions and potential need to convert Evaluation Species to Covered Species through an amendment to the RHCP.

[1] The estimate of impact is based on a projected 50% level of participation in the RHCP, a level that may be exceeded over the life of the RHCP.
[2] The actual preserve acreage will be a function of several unknown factors, including the amount of take eventually authorized through the RHCP, the actual participation rate, future opportunities for land acquisition, and the mitigation ratios to be determined on a project-by-project basis.

While a mitigation ratio of 1:1 will be typical, the ratio may be adjusted to as much as 3:1 if an RHCP participant's property is found, based on quantification of habitat values, to contain habitat of higher quality than the Comal County norm, or is adjacent to high-quality habitat, and/or is known to support an unusually high density of golden-cheeked warblers.

High-quality habitat that may require an increased mitigation ratio may be defined as any portion of a block of mature woodland 250 acres or greater in size that supports an overstory canopy of Ashe juniper and mixed hardwoods with average tree heights in excess of 20 feet (6 meters) and

with 70–100 percent canopy closure. Scientists (Coldren 1998, Wahl et al. 1990) determined that patches of suitable golden-cheeked warbler habitat that are less than 250 acres in size are less likely to have high densities of occupancy than patches greater than or equal to 250 acres in size. Habitat values will be judged by a Service-permitted biologist according to TPWD (2006) warbler habitat assessment criteria and proximity to established conservation areas. Unusually high warbler densities would be equal to or less than 10 acres per pair based on the Wahl et al. (1990) determination that 250 acres of high quality golden-cheeked warbler habitat can support up to 30 pairs. When impacted habitat is of higher quality than the Comal County norm and the impacts would preclude realization of RHCP biological goal and objectives, the RHCP reserves the right to deny participation of a land development project. In such an event, the project proponent may apply directly to the Service for an individual incidental take permit.

The County is requesting a Permit to cover the incidental take associated with the loss of 1,000 acres of black-capped vireo habitat. Take for the black-capped vireo may be authorized as soon as the Permit is issued and conservation credits are available for sale to participants (mitigation for the black-capped vireo will be provided as explained in the following paragraph). The mitigation ratio for impacts to black-capped vireo habitat will typically be 1:1, but the County will, based on quantification of habitat values and assumed higher levels of take, increase the mitigation ratio from 1:1 to as much as 2:1. Habitat values will be judged by a Service-permitted biologist according to TPWD vireo habitat assessment criteria and proximity to established conservation areas. When presence/absence surveys have been performed, numbers of pairs or singing males/unit area will be taken into consideration.

Mitigation for Impacts to the Golden-cheeked Warbler. Mitigation for the authorized incidental take of the golden-cheeked warbler will be accomplished either through acquisition of preserve lands (in fee or by conservation easement as approved by the Service) for the purpose of generating conservation credits, or through the purchase of golden-cheeked warbler credits from other Service-approved conservation banks whose service areas include Comal County. Each preserve established by the County for the purpose of generating mitigation credits under the RHCP must be approved by the Service on a case-by-case basis.

The number of acres of golden-cheeked warbler habitat preserved through either the establishment of in-county preserves or acquisition of conservation credits, or some combination of the two, as approved by the Service, will total up to an estimated 6,548 acres (2,650 hectares). This figure is based on the assumption that 5,238 acres of warbler habitat will be impacted by RHCP participants over 30 years (i.e., a 50 percent participation rate). The actual preserve acreage will be a function of several unknown factors, including the amount of take eventually authorized through the RHCP, the actual participation rate, future opportunities for land acquisition, and the mitigation ratios to be determined on a project-by-project basis. The mitigation ratio will depend upon the quality of the participant's impacted habitat. An estimated 80 percent of projects will mitigate at 1:1; 15 percent will mitigate at 2:1; and 5 percent of projects will mitigate at the highest level, 3:1. The combined mitigation ratio for an estimated 5,238 acres of take thus results in a total estimated preserve area of 6,548 acres.

In the event participation exceeds 50 percent, or the original estimates of habitat loss prove to be low, and the County wishes to receive take authorization beyond that requested in the County's

application for an incidental take permit, the County may seek an amendment to the permit to increase the amount of take for which the County is authorized. Such an amendment would likely require the County to purchase additional preserves sufficient to offset additional mitigation needs. These preserves will serve as mitigation for impacts covered by the RHCP. The participation fee for golden-cheeked warbler will likely start at $7,500/acre for RHCP mitigation credits, although higher participation fees are also being considered. Costs for non-participants (i.e., those outside of the County or those inside the County with separate ESA authorizations) will be determined on a case-by-case basis by the County.

Mitigation for Impacts to the Black-capped Vireo. The County will provide mitigation for any impacts it authorizes to the black-capped vireo in one of the following ways:

- Acquisition of credits from a Service-approved conservation bank for the black-capped vireo, the service area of which includes Comal County, or, in the event the service area does not include Comal County, if the Service has specifically approved the sale of credits to Comal County.
- Acquisition (in fee title or easement) and operation, management, and monitoring in perpetuity of habitat for the black-capped vireo, including as a component of a preserve also providing habitat for the golden-cheeked warbler.
- Black-capped vireo habitat owned by a potential participant and used for the purposes of providing mitigation in exchange for participation in the RHCP. In this instance, the participant would be required to maintain the mitigation land as black-capped vireo habitat in perpetuity.

In all events, no impacts to the black-capped vireo will be authorized through the RHCP unless and until sufficient black-capped vireo conservation credits have been obtained in one or more of the foregoing manners.

Both the golden-cheeked warbler and the black-capped vireo will also benefit from the implementation and funding of a 30-year prioritized research effort and public awareness program on the County's endangered and rare species.

Conservation Measures for the Evaluation Species. The status of these species will be monitored and assessed, and the list of Evaluation Species will be updated annually. The Evaluation Species that share habitat with the Covered Species are expected to receive collateral benefit from the mitigation measures in this RHCP. For example, consideration would be given to selection of preserve sites where as many as possible Covered and Evaluation Species occur together. Evaluation species that occur on or near preserves established for the benefit of the Covered Species may be protected from the impacts of development, particularly any adverse impacts to water quality that may potentially occur despite the regulations in place designed to prevent or minimize adverse impacts.

PARTICIPATION PROCESS

Participation in this RHCP is completely voluntary. Any party within Comal County desiring to undertake activities covered by this RHCP within an area that contains potential habitat for either

or both Covered Species may be eligible for participation in the RHCP. The County will, however, reserve the right to deny participation in the RHCP where that participation would not be consistent with the biological goals and objectives of the RHCP or might cause there to be insufficient mitigation available for anticipated County infrastructure needs.

Pursuant to provisions applicable to Comal County under Texas Parks and Wildlife Code Chapter 83, Comal County will not mandate any of the following as part of, or to facilitate approval or implementation of, this RHCP:

- Impose any sort of regulation related to endangered species unless that regulation is necessary to implement this RHCP.
- Discriminate against a permit application, permit approval, or request for utility service to land that has been designated a habitat preserve or potential habitat preserve for this RHCP, has been designated as critical habitat under the ESA, or contains endangered species or endangered species habitat.
- Limit water or wastewater service to land that has been designated as habitat preserve or potential habitat preserve.
- Require landowner to pay a mitigation fee or set aside, lease, or convey land as habitat preserve as a condition for obtaining governmental approvals not related to this RHCP.

Although participation will typically involve the payment of "participation fees," it is possible that some participants may desire to donate land occupied by Covered Species in lieu of paying the participation fees. All transactions involving land-in-lieu of participation fees will be negotiated on a case-by-case basis, will be supported by appraisals and other appropriate analyses acceptable to the County and the participant, and must be approved by the Service.

ESTABLISHING GOLDEN-CHEEKED WARBLER PRESERVES

A potential preserve property would typically contain a minimum 500 acres of high-quality golden-cheeked warbler habitat; however, acquisition of preserve land may be in smaller parcels if the subject acquisition is contiguous to an existing conservation area (e.g., the Morton Preserve) that has been established for the benefit of the golden-cheeked warbler, or if the Service approves establishment of smaller preserves on a case-by-case basis. The County may accept donations of suitable habitat in parcels less than 500 acres in size, but eligibility for mitigation credits under the RHCP must be approved by the Service.

Preserves that would generate conservation credits for the RHCP may be established in three ways: 1) fee simple purchase of habitat; 2) public/private cooperation (e.g., conservation easements); and 3) private conservation banks.

1. Under the fee simple purchase approach, Comal County would purchase and acquire full title to preserve, monitor, and manage property.

2. One method (although others are possible) for public/private cooperation envisions the County entering into conservation easement agreements with landowners that involve sharing revenues as conservation credits are sold. The County might initiate this

approach by issuing a Request for Proposals for major property owners within Comal County to join the County in a cooperative program of preserve development. Assumptions made in the public/private cooperation approach may be as follows:

- The County would pay all costs for preserve establishment, as well as assume the responsibility for long-term management and monitoring.
- There would be multi-year repayment for conservation easements and/or fee simple purchase as a function of mitigation sales credits.
- The County may pay some amount of negotiated conservation easement costs or purchase costs up front.
- Any retention of mitigation credits by a conservation easement donor for that donor's use must be specified in the Conservation Bank Agreement between the donor, the County, and the Service.

3. A privately owned conservation bank would differ from a public/private conservation easement bank in that the County would not acquire a conservation easement for the subject property, nor would the County assume any responsibility for management of the preserve. Instead the landowner would independently establish a conservation bank in an agreement with the Service. The County, through the RHCP, would then facilitate participation agreements, purchase mitigation credits from the bank, then re-sell them to RHCP participants. The owner of the private conservation bank would receive the majority of the revenue stream from the sale of mitigation credits.

FUNDING SOURCES

Funding of the RHCP may come from income generated by the RHCP, including the sale of mitigation credits (also known as "participation fees"), endowment investment income, and direct contributions from the County (see the RHCP Draft Funding Plan Components below). Other potential sources of income currently under discussion include, but are not limited to, parks and open space bonds, Tax Anticipation Notes, Federal grants and appropriations, and private donations.[4]

RHCP FUNDING PLAN COMPONENTS

All financial projections provided in this document or authorized under the RHCP are estimates intended to demonstrate that the RHCP is financially feasible. The funding plan presented in this document is for illustrative purposes only and is not substantially prescriptive of the timing, size, or nature of actions that may be taken or authorized under the RHCP. While specific elements of the overall financing plan will change over the 30-year Permit period, the authorized take and the mitigation to accommodate that take will not change. Every year during the 30-year life of the

[4] It has come to our attention that Hays County, through a Tax Increment Allocation program, is proposing to dedicate funds from a portion of its property tax revenues for general County maintenance and operations to support the implementation of their RHCP (Loomis Austin, Inc. et al. 2009). This approach will be explored as a possible funding mechanism for the Comal County RHCP.

RHCP the County will re-evaluate the funding plan to ensure adequate funding and appropriate disposition of excess revenues to meet RHCP goals.

Costs and income for the Comal County RHCP funding plan are summarized in the following sections, with the cumulative balance shown in Table ES-2. For more detailed information see Chapter 7, Table 7-1.

Table ES-2. RHCP total costs and income over the 30-year life of the plan.

Costs	Income	30-Year Cumulative Balance
$133,913,468	**$135,087,982**[1]	**$1,174,514**

[1] The larger income than costs reflects surpluses in only two years, Years 2 an 4, when no preserve land is acquired but golden cheeked warbler mitigation credits generated by earlier acquisitions are sold. In all other years the annual balance is zero.

Costs

- The administration of the RHCP would require one half-time salary position and operations expenses of $62,500 in Year 1, increasing annually by 3.0 percent. Total cumulative cost for RHCP administration over the 30-year life of the RHCP is estimated at $2,973,463.
- Starting at $15,000 per acre for fee simple purchase and $6,000 per acre for conservation easements, the County would acquire 300 acres (121 hectares) of golden-cheeked warbler preserve each in Years 1, 3, and 5 of the Permit; another 230 acres (93 hectares) each in Years 6–20; another 220 acres (89 hectares) each in Years 21–29; and 218 acres (88 hectares) in Year 30; for a total of 6,548 acres over the life of the RHCP. For planning purposes, it is anticipated that 2,973 acres (1,203 hectares) will be acquired through fee simple, and 3,575 acres (1,447 hectares) will be acquired through conservation easement. Per-acre acquisition costs would increase annually by an estimated 3.0 percent, adjusted as needed during the life of the permit. Total cumulative cost for preserve acquisition over the 30-year life of the RHCP is estimated at $107,083,312.
- Preserve establishment would include a one-time cost of $100/acre (for surveying, fencing, road closures, etc.) and an annual preserve management cost of $30/acre/year, increasing by 3.0 percent per year. Total cumulative cost for these functions over the 30-year life of the RHCP is estimated at $6,474,852.
- Other costs would include a research fund ($10,000/year) beginning at Year 3, a public awareness fund ($5,000/year) beginning at Year 3, and contingency fund ($5,000/year) beginning at Year 1. Costs would increase annually by 3.0 percent. Over the 30-year life of the RHCP, the total cumulative cost for the research fund at $429,309, the public awareness fund at $214,655, and the contingency fund is estimated at $237,877.
- The RHCP would include a non-wasting endowment fund to ensure that preserve management continues after the 30-year term of the Permit. Contributions to the endowment would be in varying amounts ranging from $1,000,000 to $3,000,000

beginning in Year 22 and continuing through Year 30, for a total contribution of $16,500,000.

Income

- The County would sell golden-cheeked warbler conservation credits to RHCP participants at $7,500 per credit in Year 1, with the per-credit price increasing annually by 3.0 percent. An estimated total of 6,548 acres of conservation credits would be sold over the 30-year life of the RHCP for a total of $88,230,447.
- Credits would also be made available to non-participants at a price to be determined on a case-by-case basis by the County. Because it is impossible to predict at this time, income from sale of credits to non-participants is not included in funding plan totals.
- By the end of the 30-year Permit period, the RHCP endowment would generate a total investment income of $3,575,000 at an estimated return of 5.5 percent.
- While the County will seek to conserve its resources through the use of cooperative and innovative conservation transactions described in Chapter 7, the funding plan is based on the very conservative presumption that those efforts will yield no savings and that the County will be required to make direct financial contributions to the RHCP. In the funding plan, over the 30-Year life of the RHCP, the annual direct financial contributions by the County would range from $0 to $2,883,869, with an annual average of approximately $1,440,000.

TERMINATION STATEMENT

Comal County retains the right to terminate the RHCP at any time, but the County will continue to be responsible for any impacts that have occurred prior to termination and will remain obligated for the perpetual operation, management, and monitoring of all preserves acquired under the RHCP (meaning all preserves acquired through the date of termination).

CHAPTER 1 — BACKGROUND, PURPOSE, AND NEED

1.1 BACKGROUND

1.1.1 Introduction

Over the next 30 years, the population of Comal County (County), Texas, is expected to increase by 78 percent. In response to challenges posed by increased land development, the Comal County Commissioners Court and a citizens advisory committee have investigated ways to 1) protect and preserve open space for the benefit of the County's citizens, 2) to conserve the County's endangered species, and 3) to help landowners and other entities comply with the Endangered Species Act of 1973, as amended, 16 USC § 1531 et seq. (ESA) as efficiently and cost-effectively as possible. The Comal County Commissioners Court has determined that progress toward these goals will best be achieved by development and implementation of a Regional Habitat Conservation Plan (RHCP) with voluntary landowner participation.

On their Web site at http://www.fws.gov/southwest/es/EndangeredSpecies/lists, the U.S. Fish and Wildlife Service (Service) identifies the following federally listed species as having the potential to occur in Comal County:

golden-cheeked warbler (*Dendroica chrysoparia*)
black-capped vireo (*Vireo atricapilla*)[5]
whooping crane (*Grus americana*)
fountain darter (*Etheostoma fonticola*)
Peck's cave amphipod (*Stygobromus pecki*)
Comal Springs riffle beetle (*Heterelmis comalensis*)
Comal Springs dryopid beetle (*Stygoparnus comalensis*)

The Web site also lists the San Marcos salamander (*Eurycea nana*), San Marcos gambusia (*Gambusia georgei*), Texas blind salamander (*Typhlomolge rathbuni*), and Texas wild-rice (*Zizania texana*) as potentially occurring in Comal County; however, these species are currently known only from the San Marcos aquatic ecosystem in Hays County and are not likely to occur in Comal County (USFWS 1996c). These species were included in the Service's list because activities that affect water quality and quantity of the Edwards Aquifer in Comal County have the potential to affect these species in San Marcos Springs.

In addition to federally listed species, the County provides habitat for non-listed rare and/or endemic species, including at least two species of salamanders and several species of flowering plants, insects, fish, birds, and small mammals, including bats.

Section 9 of the ESA prohibits "take" of any listed endangered wildlife species (16 USC § 1538(a)). Take, as defined by the ESA, means "to harass, harm, pursue, hunt, shoot, wound, kill,

[5] Currently, there are no records of black-capped vireo occurrence in Comal County; however, suitable vireo habitat exists in the County and the species is likely to be present.

trap, capture, or collect, or to attempt to engage in any such conduct" (16 USC § 1532(19)). "Harm" is defined in the Service's regulations as "an act which actually kills or injures wildlife and may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns including breeding, feeding or sheltering" (50 CFR § 17.3 (2005)). The Service defines "harass" as "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 disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering (50 CFR § 17.3). Section 10(a)(1)(B) of the ESA authorizes the Service to issue a permit allowing take of Covered Species providing that the taking is "incidental to, and not the purpose of, the carrying out of an otherwise lawful activity." Section 10(a)(2)(A) lays out certain conditions that an applicant must satisfy to be issued an incidental take permit. These conditions include the preparation of a conservation plan that identifies the impacts that will likely result from the permitted taking, the steps the applicant will take to minimize and mitigate those impacts, and the funding that will be available to implement such steps.

As Comal County grows and development continues, compliance with the ESA could be achieved through avoiding take of listed species and avoiding destruction of potential listed species habitat; through individual applications for incidental take permits; or, if a Federal nexus exists, through ESA section 7(a)(2) consultations with the U.S. Fish and Wildlife Service (Service). However, this piecemeal approach is costly and time consuming and, ultimately, is likely not ideal for the conservation of listed species or listed species habitat. To streamline approvals for public and private projects that may impact federally listed species, to provide a higher level of conservation for listed and other rare species within the County, and to preserve the natural character of Comal County, the County is committed to offering an efficient, voluntary alternative in the form of a countywide RHCP.

In 2006, the County applied for and received an ESA section 6 HCP Planning Assistance grant of $612,852 to help defray the costs of the RHCP planning and pre-permit application activities. These funds have been used to date to convene and seek input from a citizens advisory committee and a biological advisory team, assemble needed information, and draft this document: the draft *Comal County Regional Habitat Conservation Plan* (dRHCP). The incidental take permit (Permit) associated with this RHCP will cover the entire county (Figure 1-1) and remain in effect for a 30-year period from the date of Permit issuance—likely from 2012 to 2042. Participation in the RHCP will be purely voluntary, and public and private entities may choose to obtain authorization for take through avoidance, through an ESA section 7(a)(2) consultation, or through an individual incidental take permit. At no time will the County require any individual or entity to participate in the RHCP, nor does this RHCP create new or additional restrictions on property or requirements upon landowners within Comal County.

Figure 1-1. Covered area for the Comal County Regional Habitat Conservation Plan.

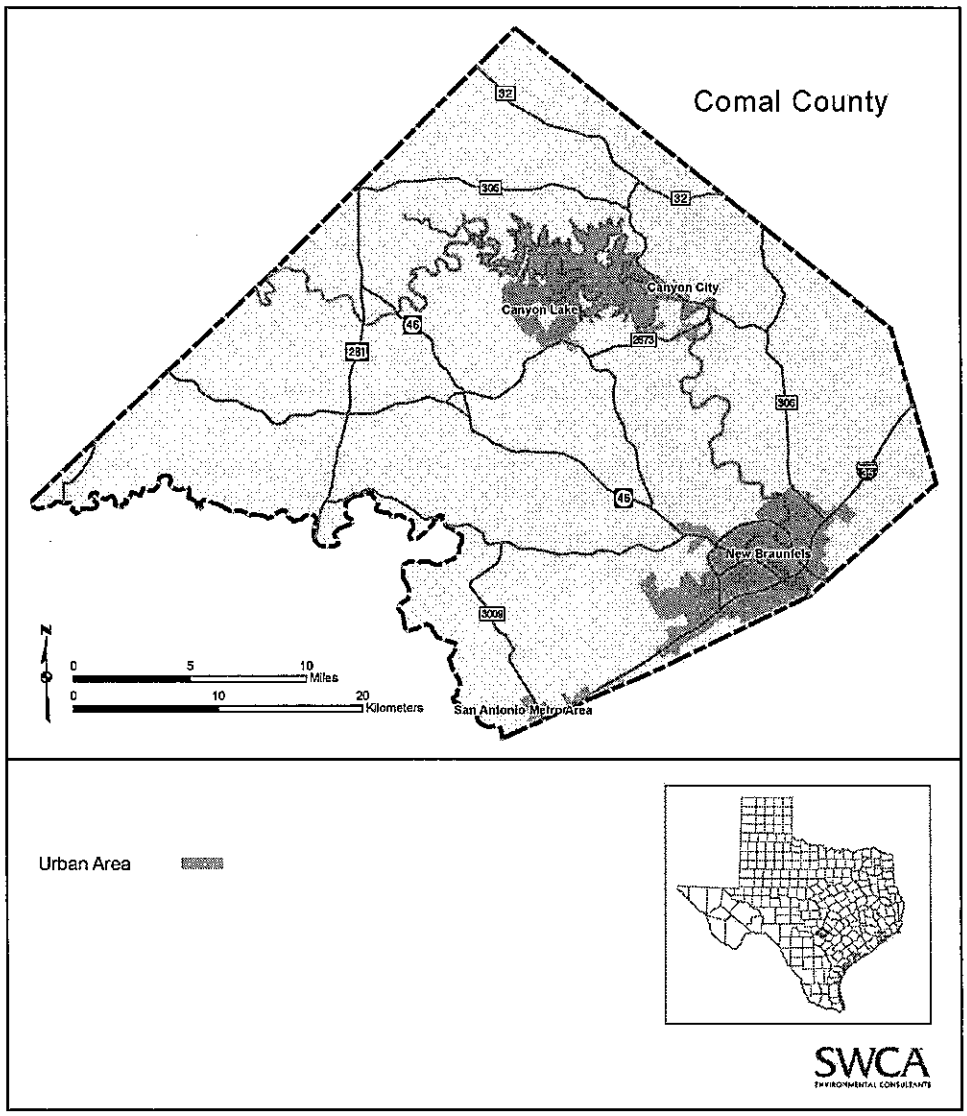

Figure 1-1. The Comal County Permit area.

1.1.1.1 Species Included in the RHCP

Two categories of species are addressed in this RHCP: Covered Species and Evaluation Species. Covered Species are the species that will be included on the Permit either initially or by subsequent amendment. Only two species will initially be considered Covered Species in the Comal County RHCP: the golden-cheeked warbler and black-capped vireo, both of which are listed as endangered under the ESA. Incidental take of these species is being sought through the issuance of a Permit to Comal County by the Service as supported by implementation of the RHCP.

"Evaluation Species" are non-listed species that have been suggested for Federal listing in citizens' petitions to the Service or are sufficiently rare within the County that a reasonable possibility exists that they will be listed during the Permit term. The Evaluation Species are not covered by the Permit because too many uncertainties exist regarding their distribution, biology, and threats to their survival, including the potential impacts of actions covered by the Permit. Scientific information is lacking that could support the level of analysis required to meet the issuance criteria for incidental take authorization. However, the Comal County RHCP includes conservation measures, including dedication of RHCP funds towards the study of one or more of the Evaluation Species, that may benefit these species and help preclude the need to list them in the future. These conservation measures may also help facilitate obtaining incidental take coverage if these species become listed in the future and coverage for take is needed. Take of Evaluation Species will only be covered by the requested Permit if the County applies for and the Service grants a major amendment to the Permit.

The Evaluation Species addressed in this document are the following:

Cagle's map turtle (*Graptemys caglei*)
a cave-obligate decapod (*Palaemonetes holthuisi*)
a cave-obligate amphipod (*Seborgia hershleri*)
a cave-obligate amphipod (*Texiweckelia relicta*)
a cave-obligate beetle (*Rhadine insolita*)
a cave-obligate harvestman (*Texella brevidenta*)
a cave-obligate spider (*Cicurina puentecilla*)
a cave-obligate spider (*Cicurina reclusa*)
a snail (nymph trumpet; *Phreatoceras taylori*)

As the RHCP program proceeds, the status of these species may be monitored and assessed, and the list of Evaluation Species may be updated. Over time, some species may be dropped from the list and others added.

1.1.1.2 Other Listed and Rare Species That May Occur in Comal County

Several federally listed species known or likely to occur in Comal County are not addressed in this RHCP for various reasons. The endangered whooping crane is not included because it occurs in the region only as an occasional transient. Development activities in the County are unlikely to have any adverse effects that rise to the level of take of whooping cranes. Similarly,

any conservation actions that could be implemented in the County are unlikely to provide any significant benefits to the species.

The listed aquatic species associated with the Edwards Aquifer (aquifer species) and known to occur in Comal County— fountain darter (*Etheostoma fonticola*), Peck's cave amphipod (*Stygobromus pecki*), Comal Springs riffle beetle (*Heterelmis comalensis*), Comal Springs dryopid beetle, and (*Stygoparnus comalensis*)—are not included in the RHCP, nor is the County seeking incidental take authorization for these species for several reasons:

1. It is not expected that the covered actions will cause take of the aquifer species because several regulations are in place to prevent or reduce to the greatest extent practicable adverse impacts to the groundwater resources upon which these species depend. Existing regulations include the Edwards Aquifer Rules (30 Texas Administrative Code, Chapter 213), which include the following requirements to protect water quality in the Edwards Aquifer. Before certain types of construction can proceed in the Recharge or Transition Zones, an Edwards Aquifer Protection Plan must be submitted to the Texas Commission on Environmental Quality (TCEQ) and adhered to during construction activities. Other plans that may be required include an organized sewage collection system plan, an underground storage tank facility plan for static hydrocarbon and hazardous substance storage, and an aboveground storage tank facility plan for static hydrocarbon and hazardous substance storage. Some types of facilities are prohibited altogether from being built in the Recharge or Transition Zones, such as Type 1 municipal solid waste landfills and waste disposal wells. Under applicable regulations, direct discharge of wastewater into streams in the Recharge Zone is also prohibited.

   To protect the quality of surface waters that may contribute to the Edwards Aquifer, Texas has developed and is required under the Federal Clean Water Act to enforce a comprehensive set of water quality standards (stream, effluent, and drinking water), including chemical, physical, and biological criteria. The stream standards (Texas Surface Water Quality Standards, Title 30, Chapter 307 of the Texas Administrative Code) establish explicit water quality goals throughout the State.

   In addition, TCEQ's Texas Pollution Discharge Elimination System (TPDES) permitting program stipulates measures that must be implemented to minimize sedimentation and contamination in surface waters by regulating the handling of storm water runoff from construction sites. The City of New Braunfels in Comal County has also adopted drainage and erosion control ordinances to protect water quality.

   Water quantity in the Edwards Aquifer is protected through the Edwards Aquifer Authority's groundwater pumping regulations. Water levels and artesian pressure in the Edwards Aquifer in the Comal and Bexar County area are monitored by the Edwards Aquifer Authority, the San Antonio Water System, and the U.S. Geological Survey at an index well (J-17 well) in San Antonio (Eckhardt–undated). To deal with occasions when aquifer water levels drop to potentially perilous levels, the Edwards Aquifer Authority has implemented a demand management/critical period management program (Schindel and Illgner 2005). Pumping rates must be reduced by stipulated percentages when water levels decline below specified levels at specified locations, including the J-17 index well and Comal and San Marcos Springs. One of the objectives of the Edwards Aquifer

management program is to maintain sufficient flow in the two springs to support the endangered aquifer species.

2. The Edwards Aquifer Authority is also working closely with the Service and numerous stakeholders through the Edward Aquifer Recovery Implementation Program created by the Texas Legislature with the express goal of contributing to the recovery of the aquifer species.
3. Texas Legislature has allowed counties little if any authority to control impacts to aquatic resources. Instead, the Legislature has made the TCEQ the primary protector of water quality within the state, and the TCEQ has developed, with the Service's approval, the Optional Enhanced Measures for the Protection of Water Quality in the Edwards Aquifer (TCEQ 2007). The Service has expressed its opinion that these measures are sufficient to avoid "take" of key aquatic species. The County is committing to making each RHCP participant aware of the Optional Measures and to encourage utilization of these measures wherever applicable and practicable.
4. Even if issuance of the requested permit were to affect the aquifer species, which is not expected, levels of take would be difficult to substantiate or quantify. The County, therefore, has elected to focus on take avoidance rather than take authorization by declining to allow participation in the RHCP until a project proponent has demonstrated adherence to all TCEQ water resource protection regulations or has certified to the County, in writing, that the project participant will adhere to all relevant laws and regulations, including those related to water resource protection. In addition, the County will encourage participants to utilize the Optional Enhanced Measures as stated above.

If it is determined that coverage would benefit both Comal County and one or more of the aquifer species, the County could apply for an amendment to the Permit. In this instance, the County would revise the RHCP to include take estimates and mitigation and funding measures specifically for the additional Covered Species. It is likely that a new Biological Opinion would be prepared by the Service to analyze potential impacts to the additional Covered Species and whether those impacts would jeopardize the continued existence of those species.

It should also be noted that, while not specifically addressed in this RHCP, it is possible that some rare, non-listed species may incidentally benefit from implementation of the RHCP if they occur in preserves established for the benefit of the Covered Species. Such non-listed species may include small mammals, birds, reptiles, amphibians, invertebrates, and plants.

1.1.2 The Concept and Benefits of a Regional Habitat Conservation Plan

Most HCPs are prepared by entities seeking an incidental take permit to cover the impacts on endangered or threatened species of a single project in a discrete area. The ESA requires that the applicant submit a proposed HCP along with the permit application. The HCP must demonstrate that the applicant will minimize and mitigate to the maximum extent practicable the impacts of the "taking" of listed species that will be covered by the Permit. Although the ESA does not specifically mention Regional HCPs, or RHCPs, the *Endangered Species Habitat Conservation Planning Handbook* (HCP Handbook) issued by the Service initially in 1996 and later

supplemented by the Addendum to HCP Handbook (65 FR 35241) discusses the concept. In contrast to individual HCPs, a regional HCP often covers a larger geographic area, numerous landowners, and multiple species. Local or regional governmental entities are often the applicant/permittee, and they commit to implement the mitigation plan contained in the RHCP. The HCP Handbook states as one of its "guiding principles" that the Service encourages state and local governments and private landowners to undertake regional and multi-species HCPs.[6]

In recent years, as conflicts between community growth and development and the ESA have increased, regionally supported HCPs are becoming more and more common. Before 1995, it was unusual for HCP planning areas to be more than 1,000 acres (405 hectares) in size. In 1996, however, approximately 25 incidental take permit action areas exceeded 10,000 acres (4,047 hectares) in size, 25 exceeded 100,000 acres (40,470 hectares), and 18 were over 500,000 acres (202,343 hectares) in size (USFWS and NMFS 1996). This trend has continued, suggesting that HCPs are evolving from an ESA compliance process used primarily to address single developments to more of a landscape or county-level planning tool designed to achieve long-term biological goals and ESA compliance. The increased popularity of regional HCPs is, in large part, based on the generalization that the greater the permit area, the more significantly reduced is the burden of ESA compliance on small landowners. Regional HCPs provide more efficient mechanisms for distributing the economic and logistic impacts of endangered species conservation among community members as a whole, and for bringing a broad range of landowner activities under the legal protection of HCPs.

In addition to providing a participatory process for ESA compliance that is less burdensome for individual landowners, several other advantages of RHCPs have been identified by the Service (USFWS and NMFS 1996), each of which appears to be applicable to Comal County's proposed RHCP. These advantages are listed below, with the Service's language from the HCP handbook underlined. Each point has been expanded upon by the authors of this RHCP.

1. <u>Maximize flexibility and available options in developing mitigation programs</u>. Individual projects often face limited options when developing mitigation proposals because of individual applicants' limited financial resources or the lack of suitable habitat available for mitigation. Development of an RHCP facilitates a regional-scale approach to ESA permitting that leads to conservation of less fragmented tracts of habitat that are better for the species and potentially less costly to the applicants. The RHCP administrative entity enjoys improved mitigation "buying power" and can pool voluntary participant payments to acquire higher quality, contiguous tracts for conservation.
2. <u>Reduce the economic and logistic burden of these programs on individual landowners</u>. The regional HCP approach introduces an economy of scale in terms of the basic logistical functions by establishing region-wide approach to impacts assessments and consolidating many of the ministerial and other HCP processing steps into one permitting process.
3. <u>Reduce uncoordinated decision making, which can result in incremental habitat loss and inefficient project review</u>. The regional HCP approach allows the Service to develop

[6] In contrast, Texas state law appears to discourage the development of HCPs (see Texas Parks and Wildlife Code § 83.012(2)).

standardized criteria for participants, facilitating the Service's efforts to ensure that similarly situated projects are treated similarly in terms of mitigation requirements.

4. Provide the permittee with long-term planning assurances and increase the number of species for which such assurances can be given. The regulatory certainty that will result from issuance of the Permit may reduce the legal and financial risks associated with public and private development and infrastructure planning.

5. Reduce the regulatory burden of ESA compliance for all affected participants. The RHCP will make it possible for each proposed project that voluntarily participates in the RHCP to obtain ESA authorization through a streamlined, efficient process potentially at less cost than obtaining individual section 10(a)(1)(B) permits and section 7(a)(2) consultations (see the HCP Handbook [USFWS and NMFS 1996]). While HCPs typically apply to projects without a Federal nexus, RHCP participation may streamline projects (including those of non-Federal governmental entities (that have other Federal nexi (e.g., Clean Water Act section 404 permit application, Federal funding, etc.). With regard to projects that may involve a Federal nexus, voluntary participation in the RHCP may assist a given Federal action agency by providing a streamlined take assessment methodology and accepted conservation measures, should the Federal action agency choose to mitigate for effects to threatened or endangered species covered by the RHCP. However, even when they propose to participate in the RHCP, Federal action agencies may still be required to consult with the Service pursuant to section 7 of the ESA. In many cases, proposed voluntary participation in the RHCP should expedite a consultation. However, it will likely be prudent for a Federal action agency to defer actual participation in the RHCP until the conclusion of such consultation. If a Federal action agency is contemplating participation in the RHCP for an activity that is also subject to section 7 consultation, that action agency is encouraged to coordinate as early as possible with the Service and Comal County regarding the anticipated process.

In addition to these benefits, the RHCP may also facilitate acquisition of Federal grants to Comal County through the Service's section 6 Habitat Conservation Plan Land Acquisition Program. Comal County has already been the beneficiary of the related Recovery Land Acquisition program. In 2007, Comal County applied for and received a $652,312 Recovery Land Acquisition Grant to purchase the 288.25-acre (117-hectare) Morton tract, which contains high-quality golden-cheeked warbler habitat and lies within a larger block of golden-cheeked warbler habitat.[7] The County will preserve and manage the Morton tract (now the Morton Preserve) to benefit the golden-cheeked warbler on the property, and to benefit the endangered fountain darter, Peck's Cave amphipod, Comal Springs riffle beetle, and Comal Springs dryopid beetle (the aquifer species) downstream of the property. It is assumed that the aquifer species will benefit by establishment of the Morton Preserve because the area is upslope of Comal Springs and will remain undeveloped.

[7] Because the Morton tract (now the Morton Preserve) was acquired with ESA section 6 grant funds, it cannot be used as mitigation or to generate mitigation credits in the RHCP.

1.2 LEGAL REQUIREMENTS RELEVANT TO REGIONAL HABITAT CONSERVATION PLANS

1.2.1 Federal Law

1.2.1.1 Endangered Species Act and Related Policy

Section 10(a)(2)(A) of the ESA provides that in order to obtain an incidental take permit, the applicant must submit a conservation plan that satisfies several substantive criteria: (1) the impact that will likely result from the taking; (2) the steps the applicant will take to minimize and mitigate the impacts and the funding available to implement those steps; (3) what alternative actions to taking were considered and the reasons the alternatives were not chosen; and (4) other measures that the Service may require as necessary or appropriate for purposes of the conservation plan (16 USC § 1539(a)(2)(A)). The Service's ESA implementing regulations also give permittees "no surprises" assurances, which are provided by the Federal Government through the section 10(a)(1)(B) process to non-Federal landowners. Pursuant to regulations at 50 CFR §§ 17.22, 17.32, and 222.2, private landowners are assured that if "unforeseen circumstances" arise, the Service will not require the commitment of additional land, water, or financial compensation or additional restrictions on the use of land, water, or other natural resources beyond the level otherwise agreed to in the HCP without the consent of the permittee. The federal Government will honor these assurances as long as the permittee is implementing the terms and conditions of the HCP, permit, and other associated documents in good faith. The HCP Handbook provides overall guidance on the elements of an HCP.

Section 7(a)(2) of the ESA requires that each Federal agency must consult with the Service to ensure that agency actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat (16 USC § 1536(a)(2)). "Jeopardize" is defined by the regulations as engaging in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of the survival and recovery of a listed species in the wild (50 CFR § 402.02). Issuance of an incidental take permit is considered an action for which the mandate of consultation applies (HCP Handbook at 1–6). With respect to the issuance of incidental take permits, the Service functions as both the "action" agency and the "resource" agency, so that the Service is actually consulting "with itself." According to the HCP Handbook, the consultation must include direct and indirect effects on the species, as well as the impacts of the proposed project on listed plants and critical habitat, if any (HCP Handbook at 3-17 through 3-19).

1.2.1.2 National Environmental Policy Act

The issuance of a regional incidental take permit is a Federal action subject to the requirements of the National Environmental Policy Act (NEPA) (42 USC §§ 4321–4327). NEPA requires Federal agencies to 1) study proposed projects to determine if they will result in significant environmental impacts; and 2) review the alternatives available for the project and consider the impact of the alternatives on the environment (42 USC § 4332(c)). The scope of NEPA is broader than the scope of the ESA in that it requires agencies to consider the impacts of the action on the "human environment," including a variety of resources. In the context of an HCP

and incidental take permit, the scope of the NEPA analysis covers the direct, indirect, and cumulative impacts that are reasonably certain to occur within the action area (HCP Handbook at 5-1). For more information regarding NEPA as it relates to this RHCP, please refer to the Service's Environmental Impact Statement (EIS) prepared in connection with the RHCP effort.

The HCP Handbook describes the Service's procedures for complying with NEPA with respect to HCPs. Most large-scale RHCPs require preparation of an EIS to comply with NEPA. An Environmental Assessment and a Finding of No Significant Impact may be appropriate, however, in smaller-scale HCPs where the mitigation measures in the RHCP are comprehensive enough to offset the anticipated environmental impacts of the project. For more information regarding NEPA as it relates to this RHCP, please refer to the Service's EIS prepared in connection with the RHCP effort.

1.2.2 Texas State Law Relevant to Regional Habitat Conservation Plans

The Comal County RHCP complies with all Texas state laws relevant to RHCPs, which include requirements for a local government's role in developing, adopting, approving, or participating in a regional HCP (Senate Bill 1272, codified as Subchapter B, Chapter 83 of the Texas Parks and Wildlife Code). Chapter 83 requires, among other things, that the governmental entity applying for an incidental take permit and developing a regional HCP to establish a citizens advisory committee, appoint a biological advisory team, comply with open records/open meetings laws, conduct a public hearing, and acquire preserves by specific deadlines.

Under Chapter 83, governmental entities participating in a regional HCP are prohibited from:

- Imposing any sort of regulation related to endangered species (other than regulations involving groundwater withdrawal) unless that regulation is necessary to implement a regional HCP for which the governmental entity was issued a Federal permit (Texas Parks and Wildlife Code § 83.014(a)).
- Discriminating against a permit application, permit approval, or request for utility service to land that has been designated a habitat preserve or potential habitat preserve for a regional HCP, has been designated as critical habitat under the ESA, or contains endangered species or endangered species habitat (Texas Parks and Wildlife Code § 83.014(b)).
- Limiting water or wastewater service to land that has been designated as habitat preserve or potential habitat preserve (Texas Parks and Wildlife Code § 83.014(c)).
- Requiring a landowner to pay a mitigation fee or set aside, lease, or convey land as habitat preserve as a condition for obtaining governmental approvals not related to the regional HCP (Texas Parks and Wildlife Code § 83.014(d)).
- Accepting a Federal permit in conjunction with a regional HCP unless the qualified voters of the plan participant have authorized the issuance of bonds or other debt financing in an amount equal to the estimated cost of acquiring all land for habitat preserves within the time frame required by Chapter 83 (see below) or the plan participant has otherwise demonstrated that adequate sources of funding exist to acquire

all land for habitat preserves within the required timeframe (Texas Parks and Wildlife Code § 83.013(d)).

In addition to the above prohibitions, Chapter 83 stipulates that the mitigation included in a regional HCP, including any mitigation fee and the size of the habitat preserve, must be based on the amount of harm to each endangered species the plan will protect. However, after notice and hearing, a regional HCP may also be based on the Service's recovery criteria for the species covered by the plan (Texas Parks and Wildlife Code § 83.015).

1.3 PURPOSE AND NEED FOR ACTION

The urgency for addressing habitat and species protection in an organized and predictable manner is underscored by the rapid rate of development projected for Comal County. From 1990 to 2000, the County population increased from 51,382 to 78,021, a 50.5 percent increase (U.S. Census Bureau 2001). Based on the percentage change in population among counties during that timeframe, Comal County ranked twelfth in the state and eighty-fourth in the nation. From 2000 to 2007, the County's population increased by 34 percent to 104,751 (U.S. Census Bureau 2009). From 2009 to 2039, the County population is expected to grow to 202,500 a 78 percent population increase over the 30-year period (Texas Perspectives, unpublished data). The increase in population will create a need for more infrastructure, more housing, and other development projects. Increased land development in the County is likely to cause the loss and disturbance of habitat used by federally listed species. Thus, compliance with the ESA will be critical.

Aside from satisfying the 10(a)(1)(B) issuance criteria, the RHCP will benefit the County and its citizens because it will provide a substantially less cumbersome and expensive process for ESA compliance for public and private entities that intend to carry out development projects. Through this RHCP, the County will approach conservation at a regional, rather than piecemeal, scale. This will benefit the Covered Species by enabling larger, more contiguous preserves, and by making related management, monitoring, and research efforts more efficient. The RHCP will also preserve open space in Comal County, which will help to retain the County's Hill Country character. The RHCP will also benefit the County by enhancing its reputation as an entity that facilitates stable and orderly development. This should be an attractive attribute for those considering relocating to Comal County or starting businesses here.

1.4 TERMINATION STATEMENT

Comal County retains the right to terminate the RHCP at any time, but the County will continue to be responsible for any impacts that have occurred prior to termination and will remain obligated for the perpetual operation, management, and monitoring of all preserves acquired under the RHCP (meaning all preserves acquired through the date of termination).

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CHAPTER 2 – COVERED AND EVALUATION SPECIES

2.1 INTRODUCTION

The Covered Species in this RHCP are the golden-cheeked warbler and the black-capped vireo. Incidental take of these species will be authorized through issuance of the proposed section 10(a)(1)(B) permit to Comal County by the Service as supported by implementation of the RHCP. The Evaluation Species, while considered potentially rare, would not be covered by the proposed Permit, nor, absent a permit amendment, would they be covered by the Permit should they be listed in the future. Covered Species are discussed in greater detail in Section 2.2, below. Additional information on the Evaluation Species is provided in Section 2.3.

2.2 COVERED SPECIES

2.2.1 Golden-cheeked Warbler (*Dendroica chrysoparia*)

The golden-cheeked warbler was emergency listed May 4, 1990, and gained permanent listing status December 27, 1990 (55 FR 53153–53160).

2.2.1.1 Golden-cheeked Warbler Natural History

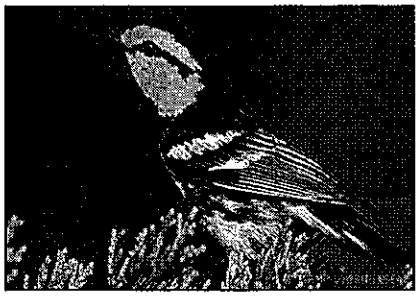
Photo by Steve Maslowski

The golden-cheeked warbler winters in southern Mexico and northern Central America and breeds in the Edwards Plateau and Cross Timbers Level III ecoregions of central and northern Texas.[8] Figure 2-1 shows the range of this species in Texas by county. Most golden-cheeked warblers arrive in central Texas in early to mid-March and start returning to their wintering grounds in July. Figure 2-2, taken from DeBoer and Diamond (2006), shows the golden-cheeked warbler's breeding habitat, county by county, with Comal County at the southeastern boundary of the range.

Golden-cheeked warbler breeding habitat typically consists of relatively dense and mature woodland composed of a combination of Ashe juniper (*Juniperus ashei*) and hardwood tree species, especially plateau live oak (*Quercus fusiformis*), Texas red oak (*Q. buckleyi*), and shin oak (*Q. sinuata* var. *breviloba*). Other hardwood tree species often found in golden-cheeked warbler breeding habitat include escarpment black cherry (*Prunus serotina* var. *eximia*), Arizona black walnut (*Juglans major*), cedar elm (*Ulmus crassifolia*), and Texas ash (*Fraxinus texensis*).

[8] The Level III ecoregions are subdivided into Level IV ecoregions. Comal County falls almost entirely within the Balcones Canyonlands subdivision of the Edwards Plateau ecoregion, with only a small strip along the southeastern border falling within the Floodplains and Low Terraces subdivision of the Texas Blackland Prairies ecoregion.

Figure 2-1. The breeding range of the golden-cheeked warbler in Texas (after Pulich 1976) and designated recovery regions (USFWS 1992).

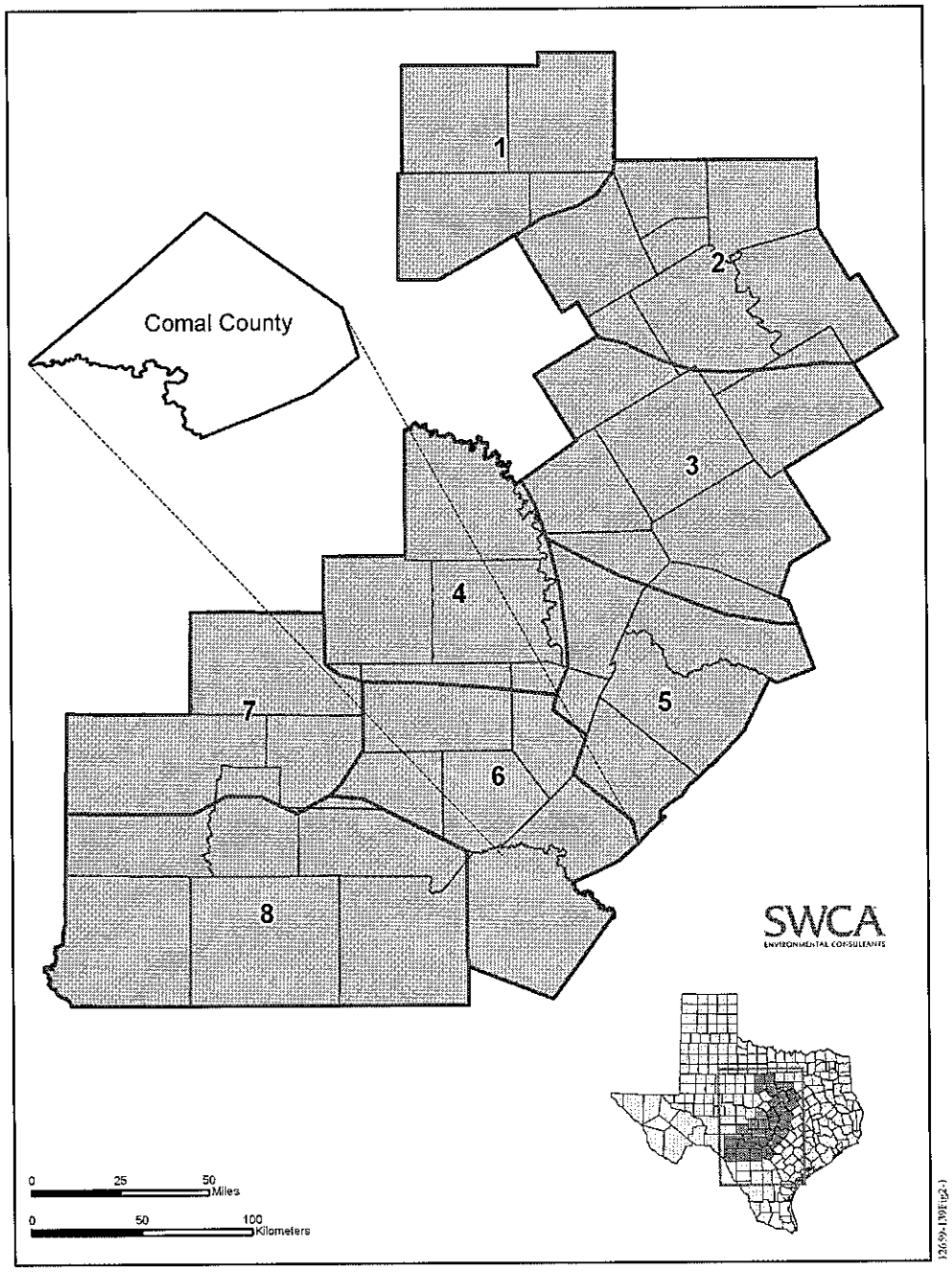

Figure 2-1. The breeding range of the golden-cheeked warbler (exclusive to Texas) (after Pulich 1976), and designated recovery regions (USFWS 1991).

Figure 2-2. The breeding range of the golden-cheeked warbler and relative density of breeding habitat by county.

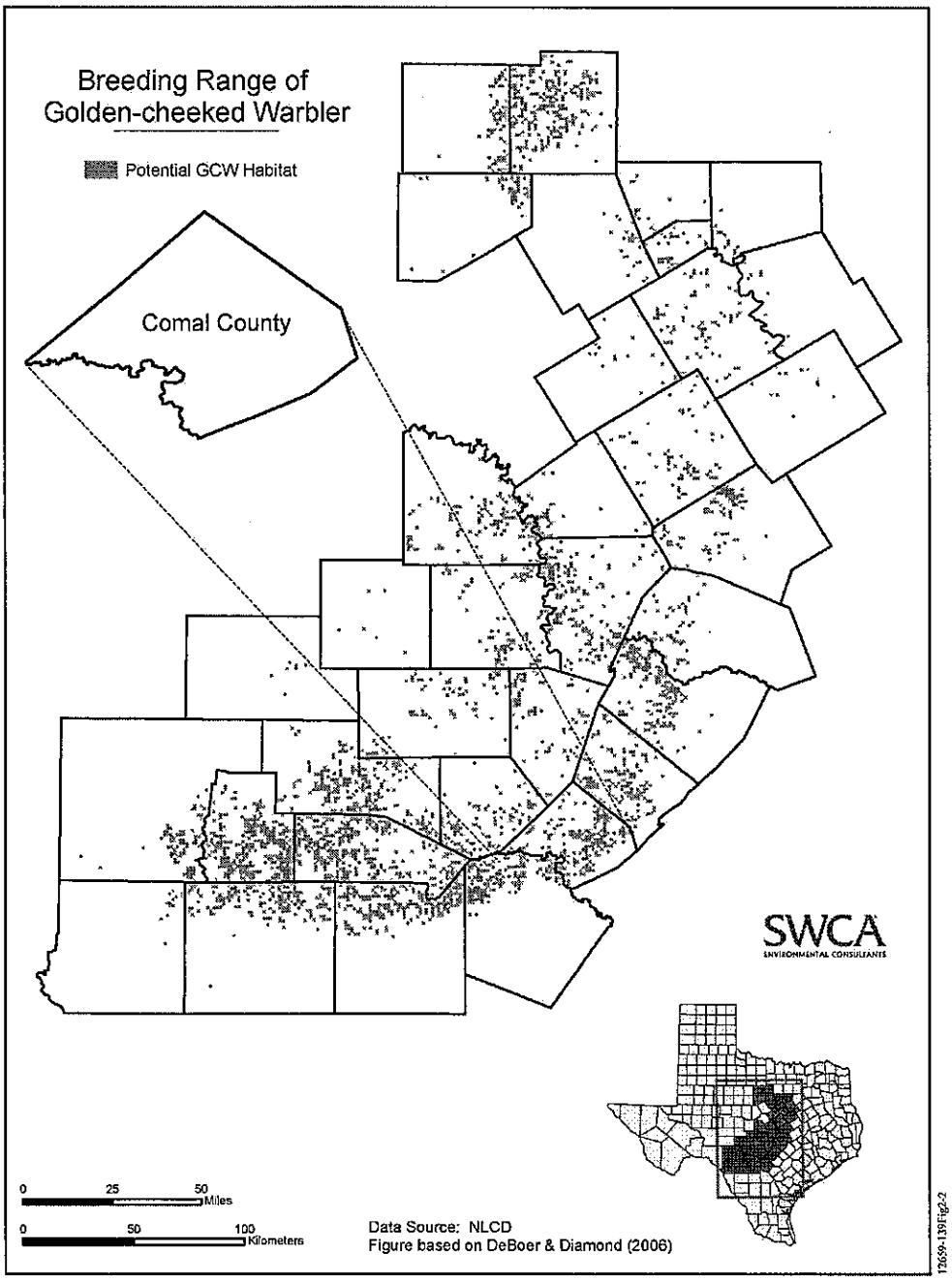

Figure 2-2. The breeding range of the golden-cheeked warbler and relative density of breeding habitat by county.

Ashe juniper can account for 10 to 90 percent of trees present in golden-cheeked warbler habitat, and hardwoods can account for 10 to 85 percent of trees present. Woodlands regularly used by golden-cheeked warblers for nesting and fledging also typically have canopy cover greater than 50 percent and tree height greater than 10 feet (3 meters) (USFWS 1996a, Alldredge et al. 2002). Fledglings will also use woodlands not suitable for nesting as they disperse from the nest (P. Sunby, SWCA, pers. obs.).

In Comal County, the range of the golden-cheeked warbler is limited to "Hill Country" habitats west of the Balcones Escarpment. Warbler habitat develops best in hilly areas where the porous, water-bearing Edwards Formation and other, underlying impermeable formations are exposed because seepage on hillsides at the exposed basal contact of the Edwards Formation supports the deciduous tree species preferred by the warbler. Hilly areas where the Edwards Formation is absent have drier substrate conditions that support fewer or no deciduous trees and so do not support as good of habitat.

Where land is flatter and only the Edwards Formation is exposed, water usually infiltrates the ground beyond the root zone, resulting in the development of comparatively xeric woodlands composed of Ashe juniper and live oak used by golden-cheeked warblers, with few or no deciduous trees. In Comal County, flatter Hill Country lands where the Edwards Formation is absent are underlain by the impermeable Glen Rose Formation. Surface water runs off this formation rather than infiltrating it, so this formation also typically does not support high quality golden-cheeked warbler habitat. Also, flat terrain is more apt to have been cleared and kept cleared of Ashe juniper to create grazing land. Because of the difficulty in clearing trees, steep terrain is more likely to remain wooded. Thus, for both geological and land management reasons, the distribution of higher quality golden-cheeked warbler habitat is usually associated with steep, rough topography (USFWS 1992, TPWD 2006, P. Sunby, SWCA, pers. obs.).

Territory Density. The density at which golden-cheeked warblers occur in woodlands is known to vary with habitat quality. Typically, the species will defend territories of 4 to 8 acres (1.6–3.2 hectares) in higher quality habitat, but may establish territories of 16 to 20 acres (6.5–8.1 hectares) or larger in lower quality habitat (USFWS 1996a). Pulich (1976) used golden-cheeked warbler densities of 19.8 acres (8 hectares)/pair, 49.4 acres (20 hectares)/pair, and 81.5 acres (33 hectares)/pair for good, average, and marginal habitat, respectively, in formulating one of the first population estimates for the species. Subsequent studies have reported a range of territory densities from 50 acres (20 hectares)/pair to 3.3 acres (1.3 hectares)/pair (Kroll 1980, Wahl et al. 1990, USFWS 1996a, Travis County Natural Resources Division 2004).[9]

Habitat Quality and Patch Size. As discussed below, some studies indicate that woodland patch size influences golden-cheeked warbler use of potentially suitable habitat. In general, habitat quality decreases as density of deciduous trees and/or percent canopy closure decreases (Beardmore 1994, DeBoer and Diamond 2006). Recent studies demonstrate that habitat requirements vary depending on landscape-level factors such as patch size, tree species composition and structure, slope, adjacent land use, and distance from larger blocks of regularly

[9] Researchers variously represent density as acres or hectares per male, territory, or pair. For consistency and to avoid confusion, the expression "acres/pair" is used throughout in this document.

occupied habitat (Dearborn and Sanchez 2001, Miller et al. 2001, Magness et al. 2006, DeBoer and Diamond 2006).

Wahl et al. (1990) excluded patches of potentially suitable woodland that were less than approximately 123.5 acres (50 hectares) in size from a habitat-based estimate of range-wide breeding population as they believed this was the lowest patch size of importance to breeding golden-cheeked warblers. They considered prime habitat to be in woodland patches that are at least 247 acres (100 hectares) in size (Wahl et al. 1990). Since 1990, other studies have attempted to identify minimum golden-cheeked warbler habitat patch size requirements. DLS Associates and WPTC Consulting Group (1994) found that the smallest of 11 habitat areas supporting one to two golden-cheeked warblers in Travis County were 102–325 acres (41.1–131.6 hectares). Arnold et al. (1996) suggested that approximately 56.8 acres (23 hectares) was the minimum threshold patch size required for golden-cheeked warbler occupancy and consistent production of young. Based on a study of 100 patches of woodland of varying sizes, Coldren (1998), like Wahl et al. (1990), concluded that golden-cheeked warblers selected against patches of woodland smaller than approximately 247 acres.

Coldren (1998) investigated the relationship of occurrence and breeding success of golden-cheeked warblers to human use of land directly adjacent to habitat patches but only explored cursorily the relationship of occurrence of golden-cheeked warblers to degree of isolation of potential habitat patches and use of lands between patches. In general, the chance for occurrence of golden-cheeked warblers in a smaller patch of woodland that appears suitable for use from a vegetative standpoint generally decreases with increased distance of that patch from a larger block of occupied habitat. It also appears that presence of extensive amounts of human development between a patch of potentially suitable woodland and a larger block of occupied habitat further decreases the probability of that patch being utilized by golden-cheeked warblers (Wahl et al. 1990, Coldren 1998).

Magness et al. (2006) developed a method for predicting presence or absence of golden-cheeked warblers in a given landscape and found that the birds occurred in a habitat patch only when landscape composition within a 400-meter radius exceeded 40 percent woodland, and that the likelihood of occupancy was greater than 50 percent only when landscape composition exceeded 80 percent woodland. While they could not rule out a relationship between habitat fragmentation and overall habitat quality as measured by nesting success and recruitment, Magness et al. (2006) did conclude that common measures of habitat fragmentation, including development density at habitat edge, mean-nearest neighbor, and distance between woodland patches, were poor predictors of species occurrence across all spatial scales. The existing studies on optimum patch size for the golden-cheeked warbler are useful for describing optimum or prime habitat, but they do not provide limits on the smallest patch size within which the species *could* be found nesting. The smallest discrete patch of woodland in which avian biologists at SWCA Environmental Consultants (SWCA) have observed golden-cheeked warblers successfully fledging young was approximately 11 acres (4.5 hectares) in size (SWCA unpublished data). This patch was set in a rural landscape and was surrounded by open grassland, although larger patches of golden-cheeked warbler habitat occurred commonly in the area. The nearest larger patch was approximately 75 acres (30.4 hectares) in size and occurred approximately 600 to 800 feet (183–244 meters) away from the 11-acre patch.

Breeding Range Population Size. The total golden-cheeked warbler population is not precisely known, but distribution of the species across its breeding range in Texas is thought to be patchy and localized (Ladd and Gass 1999). In 1990, Wahl et al. estimated the population to range from 4,822 to 16,016 breeding pairs. Corrections to the Wahl et al. (1990) estimate were applied in the Golden-cheeked Warbler Recovery Plan to derive a 1990 population estimate of 13,800 pairs (USFWS 1992). No range-wide population estimate has been made since that time, but it is possible that the population has increased since 1990. For example, at Fort Hood Military Reservation (Fort Hood), Coryell and Bell Counties, where golden-cheeked warblers are afforded some protection and management, and where annual population censuses have taken place for over a decade, golden-cheeked warbler detections along point count routes almost doubled from 1992 to 2003 (The Nature Conservancy 2005). Based on extrapolation from golden-cheeked warbler densities in established study areas, total golden-cheeked warbler population on Fort Hood in 2003 was estimated to be approximately 4,514 pairs on 52,935 acres (21,431 hectares), or 11 acres/pair (Peak 2003, USFWS 2005c). The Service is currently conducting a status review of the golden-cheeked warbler that is likely to result in a revised estimate of the total population number, and SWCA has been contracted by the Texas Department of Transportation to independently assess the species' status. SWCA's preliminary estimates indicate that there may be up to 20,000–25,000 breeding golden-cheeked warbler pairs throughout their range, 10,000 pairs over the 1990 estimate (SWCA 2007).

2.2.1.2 Primary Threats to the Golden-cheeked Warbler

The greatest threats to the continued existence of the golden-cheeked warbler are loss of habitat and urban encroachment within its breeding habitat (Wahl et al. 1990, USFWS 1992, Coldren 1998). Other factors include the loss of deciduous oaks (used for foraging) to oak wilt, brood parasitism by brown-headed cowbirds (*Molothrus ater*), predation by Texas rat snakes (*Elaphe obsolete lindheimeri*) (Reidy et al. 2008), and predation by and competition with blue jays (*Cyanocitta cristata*) and other urban-tolerant birds (USFWS 1992). Human agricultural activities have also eliminated a considerable amount of golden-cheeked warbler habitat within the central and northern parts of the range of the species (USFWS 1992). Habitat loss continues as suburban developments spread into golden-cheeked warbler habitat along the Balcones Escarpment, especially in a growth corridor from Williamson County southward through Bexar County (USFWS 2005a).

A common factor in the decline of neotropical migratory passerines is loss of wintering habitat and habitat degradation and/or destruction in core breeding areas. Some studies (Robinson 1992, Donovan et al. 1995) also show that declining populations of neotropical migrants in marginal, outlying habitats may be due to declining productivity in central populations that would normally emigrate to the less productive areas. Research on golden-cheeked warblers has indicated that occupancy and productivity are significantly lower in "small" patches of habitat than in larger ones (Maas-Barleigh 1997, Coldren 1998).

Populations of golden-cheeked warblers appear to be less stable in small habitat patches surrounded by urbanization (Engels 1995, Arnold et al. 1996, Moses 1996). The Service and TPWD have consistently suggested that clearing and construction activities within 300 feet of

occupied habitat may result in regulated impacts to the golden-cheeked warbler (Campbell 1995). Some studies indicate that abundance of the golden-cheeked warbler is reduced within 656 to 1,640 feet (200–500 meters) of an urban edge (Engels 1995, Arnold et al. 1996, Coldren 1998). Coldren (1998) reported that golden-cheeked warbler occupancy declined with increasing residential development and roadway width. Moreover, increases in the amount of development typically lead to fragmentation of remaining golden-cheeked warbler habitat. Habitat fragmentation can lead to increased predation rates and increased distances for juvenile dispersal, thus decreasing recruitment (Robinson et al. 1995, Coldren 1998, Rappole et al. 2003).

Currently, three large populations[10] of golden-cheeked warblers receive some degree of protection. These populations breed on the Balcones Canyonlands National Wildlife Refuge in Burnet, Travis, and Williamson Counties; on Balcones Canyonlands Conservation Plan lands in Travis County; and on Fort Hood lands in Bell and Coryell Counties. Medium-sized populations receiving some form of protection occur on U.S. Army Corps of Engineers' (Corps) land at Lake Georgetown in Williamson County; Hickory Pass Ranch in Burnet County; Pedernales Falls State Park in Blanco County; Guadalupe River State Park/Honey Creek State Natural Area in Comal County; at Government Canyon State Natural Area, Camp Bullis Military Reservation, and the Indian Springs/Cibolo Canyon areas in Bexar County; Lost Maples State Natural Area in Bandera County; Garner State Park in Uvalde County; Kerr Wildlife Management Area in Kerr County; and Kickapoo Cavern State Park in Edwards and Kinney Counties. Small populations receive protection at Colorado Bend State Park in Lampasas and San Saba Counties; Meridian State Park in Bosque County; Dinosaur Valley State Park in Somervell County; and Possum Kingdom State Park in Palo Pinto County. Additionally, potential golden-cheeked warbler habitat is preserved in numerous municipal parks and areas set aside for purposes of aquifer protection (e.g., Honey Creek State Natural Area, City of San Antonio and City of Austin aquifer protection lands) and preservation of endangered species (mitigation preserves and conservation easements).

2.2.1.3 Golden-cheeked Warbler Recovery Plan

The Service prepared a Recovery Plan for golden-cheeked warblers in 1992, which divided the breeding range of the golden-cheeked warbler into eight regions. Region boundaries were based on considerations such as geology, vegetative cover, and watershed boundaries (USFWS 1992). All of Comal, Bexar, and Kendall Counties and portions of Blanco, Kerr, and Gillespie Counties are within Recovery Region 6 (See Figure 2-1).

The Recovery Plan identified preservation and protection of one viable golden-cheeked warbler population in each of the eight recovery regions as a primary criterion for delisting of the species. "Viable population" is not defined in the Recovery Plan, although it was suggested that a viable population of golden-cheeked warblers could range from 500 pairs to a few thousand individuals. More recently, the Service has indicated a viable population of golden-cheeked warblers may need to be as large as 3,000 pairs (USFWS 1996a, Alldredge et al. 2002).

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[10] "Large populations" of golden-cheeked warblers number in the several hundreds to several thousands of breeding pairs (see Section 2.2.1.3). "Medium-sized populations" are in the approximately 20–100+ pairs range, while "small populations" comprise fewer than 20 pairs.

Recovery Region 6 contains from 244,106 acres (98,786 hectares; SWCA unpublished data)[11] to 769,581 acres (311,571 hectares; based on Model C in Diamond 2007) of golden-cheeked warbler habitat. Given these estimates, the acres of habitat provided for 3,000 pairs of golden-cheeked warblers may range from 81 acres (33 hectares) to 257 acres (104 hectares) per pair, which represents low to extremely low densities for this species (see Chapter 3, Section 3.2.3). While systematic surveys for golden-cheeked warblers have not occurred within Recovery Region 6, and the total warbler population is unknown, it is assumed, based on limited survey information and estimates of potential habitat within the recovery region, that the viable population goal of 3,000 pairs can be met.

A protected viable population of golden-cheeked warblers also appears to exist in Recovery Region 3 on Fort Hood, where the population is thought to comprise over 4,500 singing males (Peak 2003, USFWS 2005c). The prospect for attaining a protected viable population is also favorable in Recovery Region 5, where the golden-cheeked warbler population in Balcones Canyonlands National Wildlife Refuge is estimated to range from 800 to 1,000 pairs (C. Sexton, U.S. Fish and Wildlife Service, pers. comm. to SWCA, 2007). Hundreds more golden-cheeked warblers are thought to breed on Balcones Canyonlands Conservation Plan lands (J. Kuhl, Travis County, pers. comm. to SWCA, 2007). These two areas are relatively close together, being separated by a distance of approximately 5 miles (8 kilometers).

2.2.1.4 Current Status of the Golden-cheeked Warbler and its Habitat in Comal County

Very few golden-cheeked warbler surveys and on-the-ground habitat assessments have been conducted in the County. Notwithstanding the dearth of survey data, reasonable attempts have been made to estimate the amount of potential golden-cheeked warbler habitat present in the County (Pulich 1976, Wahl et al. 1990, Diamond and True 1999). These estimates include 20,000 acres (8,094 hectares) in 1974 (Pulich 1976); 61,272 acres (24,796 hectares) in 1988 (USFWS 1992, based on Wahl et al. 1990); and 80,600 acres (32,618 hectares) in 1999 (Diamond and True 1999). All attempts at estimating golden-cheeked warbler habitat in the County are gross estimates and lack adequate ground-truthing. Nonetheless, such estimates are the only available means to estimate golden-cheeked warbler populations in the absence of survey information.

The wide variance in estimates of habitat size cited above reflects widely different approaches using different assumptions and data. Based on their own experience with the distribution and occurrence of golden-cheeked warblers in Comal County and elsewhere, SWCA biologists judged that the actual amount of suitable golden-cheeked warbler habitat in the County lies somewhere within the range of 20,000–80,600 acres but not at either extreme of that range. They therefore prepared their own delineation of golden-cheeked warbler habitat in Comal County using Geographical Information System (GIS) techniques, recent imaging data, and the best available scientific information. SWCA then adapted an approach developed by Magness et

[11] See the following section on habitat delineation for an explanation of SWCA's methods for quantifying golden-cheeked warbler habitat and how those methods differ from those used by Diamond (2007).

al. (2006) to rank habitat quality within this delineation. The methods used and the results are reported in the following sections.

Initial Delineation of Potential Golden-cheeked Warbler Habitat. To delineate the distribution of woodlands in Comal County containing potential golden-cheeked warbler habitat, SWCA used 2004 color infrared aerial photography available through the Texas Natural Resource Information System (http://www.tnris.state.tx.us). Factors considered in the initial delineation of potential golden-cheeked warbler habitat included density of woodland, apparent density of Ashe juniper and deciduous trees, size of trees, habitat patch size, and land use at local and landscape scales. In other words, five known habitat characteristics were used to narrow the total amount of wooded landscape visible in the infrared imagery to those woodlands likely to constitute golden-cheeked warbler breeding habitat.

Woodlands for which survey data were lacking were classified as potential golden-cheeked warbler habitat if they had canopy closure in excess of 50 percent and appeared to be composed of a combination of larger Ashe juniper and broad-leafed hardwood trees. Tree heights were estimated based on crown diameter, which is apparent on the digital imagery, and the assumption that trees are generally as tall as their crown is wide. Woodlands appearing to be composed largely of smaller trees were also identified as potential habitat if percent canopy closure was greater, generally in excess of 80 percent, and if some larger hardwood trees were also present. In the context of the previous sentence, "smaller" trees were those generally believed likely to range in height from about 12 to 16 feet (4 to 5 meters), while "larger" trees were those believed likely to be in excess of about 20 feet tall. Woodland appearing to be composed almost wholly of Ashe juniper or hardwood trees was excluded from the habitat delineation, except in cases where such woodland was not extensive and was contiguous with woodlands that appeared potentially suitable for the golden-cheeked warbler.

Patches of woodland smaller than 11 acres were excluded from the delineation because this is the smallest size patch in which SWCA has observed warblers successfully fledging young. Exceptions were made for smaller patches of woodland in largely undeveloped landscapes when those patches were separated from larger blocks of potentially suitable habitat by only narrow distances (generally less than 150 feet [46 meters]), such as those created by linear features such as creeks and rivers, roads, and cleared utility easements (power lines, pipelines, etc.). It is recognized that it becomes increasingly unlikely that warblers would utilize a small patch of woodland with increasing distance of the patch from larger blocks of habitat, or increasing level of development around the patch (Engels 1995, Arnold et al. 1996, Moses 1996). However, because data are limited to provide a basis for making decisions on how to vary minimum patch size across a landscape, SWCA applied the minimum patch size of 11 acres throughout the potential range of the warbler in Comal County. This no doubt has resulted in identification of some small patches of woodland as potential habitat in developed or otherwise isolated areas that have a very low likelihood of supporting golden-cheeked warblers.

Using the methods described above, SWCA delineated approximately 65,581 acres (26,540 hectares) of woodland in Comal County as potential golden-cheeked warbler habitat (Figure 2-3). It should be noted that potential warbler habitat was delineated and quantified to facilitate development and discussion of RHCP participation methodology. These figures do not provide

assurance that areas not mapped as potential habitat for federally listed endangered species do not contain habitat for such species, nor do these figures of potential habitat constitute identification of potential preserve acquisition lands. It is the responsibility of individual landowners to ensure that activities occurring on their property are performed in compliance with provisions of the ESA.

A different approach to modeling golden-cheeked warbler habitat has been used by Loomis Austin[12] (2008) to estimate the amount of potential golden-cheeked warbler habitat in neighboring Hays County in support of an HCP planning process underway in that county. To identify potential golden-cheeked warbler habitat using data derived from satellite imagery, Loomis Austin (2008) relies on "mean tree canopy cover within a 7-cell by 7-cell rectangular neighborhood" which "approximates the size of a single golden-cheeked warbler territory" (Loomis Austin 2008:7). Using the same approach, Loomis Austin estimated that 174,410 acres (70,581 hectares) of potential habitat occurs in Comal County (A. Aurora, Loomis Austin, pers. comm. to SWCA, 2009).

A third model of potential golden-cheeked warbler habitat (Model C in Diamond 2007), like Loomis Austin (2008), uses a broad-brush strategy, identifying most forest/woodland—adjusted for edge effect—as potential golden-cheeked warbler habitat. According to this model, Comal County could contain approximately 125,086 acres (50,620 hectares) of warbler habitat. Both Diamond (2007) and Loomis Austin (2008) models incorporate fewer habitat characteristics than the SWCA method, and, as a result, identify some woodlands as potential golden-cheeked warbler habitat that the SWCA method eliminates as unsuitable. Both Diamond (2007) and Loomis Austin (2008) also used dated (1992) Landsat thematic mapper imagery and supplemental data (see http://egsc.usgs.gov/isb/pubs/factsheets/fs10800.html), which produce relatively low resolution imagery for this type of application. SWCA used more recent (2004) and finer resolution remote sensing imagery (aerial photography) to identify habitat likely to be occupied by golden-cheeked warblers. The SWCA method closely adheres to widely accepted definitions of golden-cheeked warbler habitat (USFWS 1996a, Alldredge et al. 2002, TPWD 2006) and is used in this RHCP.

Assessment of Golden-cheeked Warbler Habitat Quality. Figure 2-3 also depicts locations of golden-cheeked warbler observations made in Comal County based on records held by the Service and the Texas Parks and Wildlife Department (TPWD). A comparison of golden-cheeked warbler observations and potential habitat on Figure 2-3 shows considerable overlap. Warbler observations tend to coincide with the presence of potential habitat, although this is not always the case.

[12] The consulting firm "Loomis Austin" has since changed its name to "Loomis Partners"; however, the documents cited here were produced under the name "Loomis Austin" and that name has been retained

Figure 2-3. Golden-cheeked warbler (GCW) occurrences in Comal County, Texas, and distribution of potential golden-cheeked warbler habitat (at least 50% woodland composition in patches larger than 11 acres).

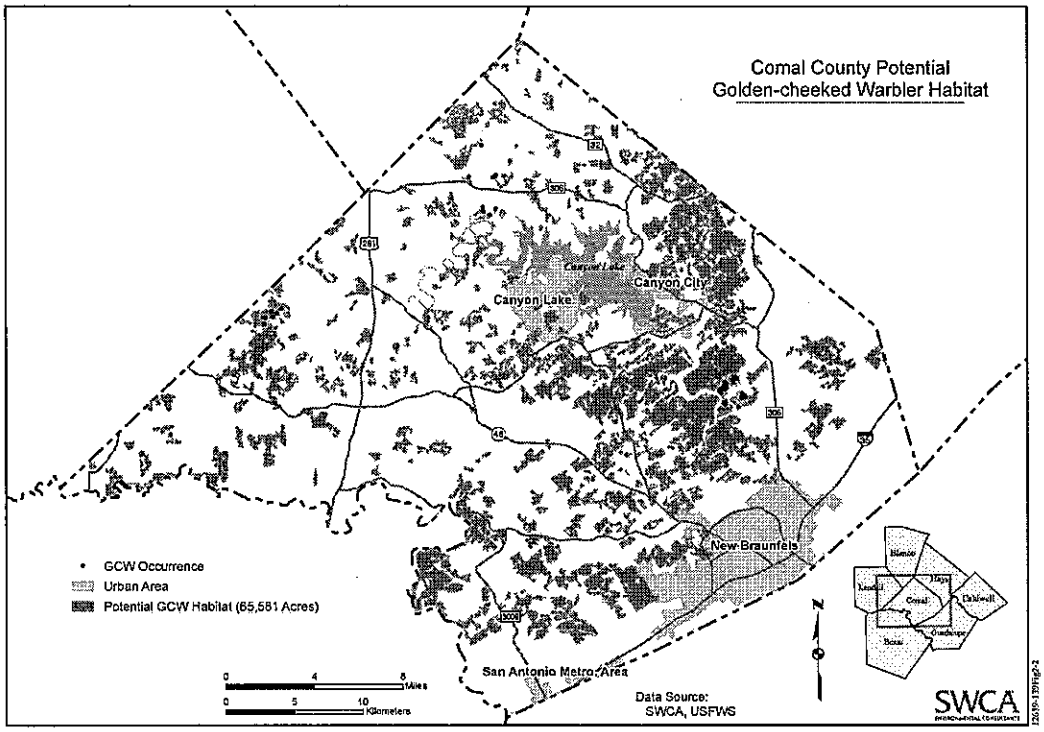

Figure 2-3. Golden-cheeked warbler (GCW) occurrences in Comal County, Texas, and distribution of potential habitat (at least 50% woodland composition in patches larger than 11 acres).

The apparent absence of habitat at a golden-cheeked warbler observation site in Figure 2-3 may indicate a loss of habitat subsequent to the sighting,[13] or possibly an incidental sighting of a migrating bird passing through unsuitable habitat. Conversely, many areas identified as potential habitat do not contain golden-cheeked warbler observations. Such areas either may not have been surveyed for golden-cheeked warblers or visited by a knowledgeable birder, or sightings did not occur during surveys. The absence of observations may also indicate that the area identified as potential golden-cheeked warbler habitat is not regularly, or ever, occupied by golden-cheeked warblers. Occupancy rates of potential habitat may vary annually as a result of natural fluctuations in the golden-cheeked warbler population.

It is also true that, while any habitat patch greater than 11 acres of woodland (all the habitat depicted in Figure 2-3) containing junipers and oaks *could* contain golden-cheeked warblers during the breeding season, it has been demonstrated that the probability of occurrence in an area increases with increasing habitat quality (Wahl et al. 1990, Coldren 1998, Magness et al. 2006).

Within the 65,581 acres of woodlands delineated in Figure 2-3, the quality of habitat and the probability that any given part of it will support golden-cheeked warblers is likely to vary greatly. Assessing the relative quality of habitat over such a large area in the absence of data on woodland species composition, canopy cover, etc., is problematic. Still, it is misleading to assume that all delineated 65,581 acres are suitable golden-cheeked warbler habitat. In an attempt to assess the delineated acreage by its probability to support golden-cheeked warblers, this RHCP employs methods developed by Magness et al. (2006).

Using remote sensing GIS techniques and logistic regression analysis, Magness et al. (2006) found that that the higher the percent woodland composition of the landscape within a 400-meter radius, and the greater the patch size of the largest woodland (also within a 400-meter radius), the greater the probability of habitat occupancy. At the 60 percent woodland composition (mature oaks and junipers), the probability of golden-cheeked warbler occupancy was approximately 20 percent. At 80 percent woodland composition, the probability of golden-cheeked warbler occupancy increased to approximately 50 percent.

Following the techniques of Magness et al. (2006), Figure 2-4 depicts portions of the woodlands within a 400-meter radius containing 80 percent or greater woodlands (in red) and at least 60 but less than 80 percent woodlands (in yellow). The remaining habitat (in green) depicts landscape with at least 50 but less than 60 percent woodlands.

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[13] All official golden-cheeked records are depicted in the figure, while the habitat delineation reflects only the most current aerial photography (2004). Some observations may have occurred at sites where suitable warbler habitat once existed but has since been lost.

Figure 2-4. Golden-cheeked warbler (GCW) occurrences in Comal County, Texas, and distribution of potential warbler habitat at 50–<60%, 60–<80%, and ≥80% woodlands composition within a 400-meter radius.

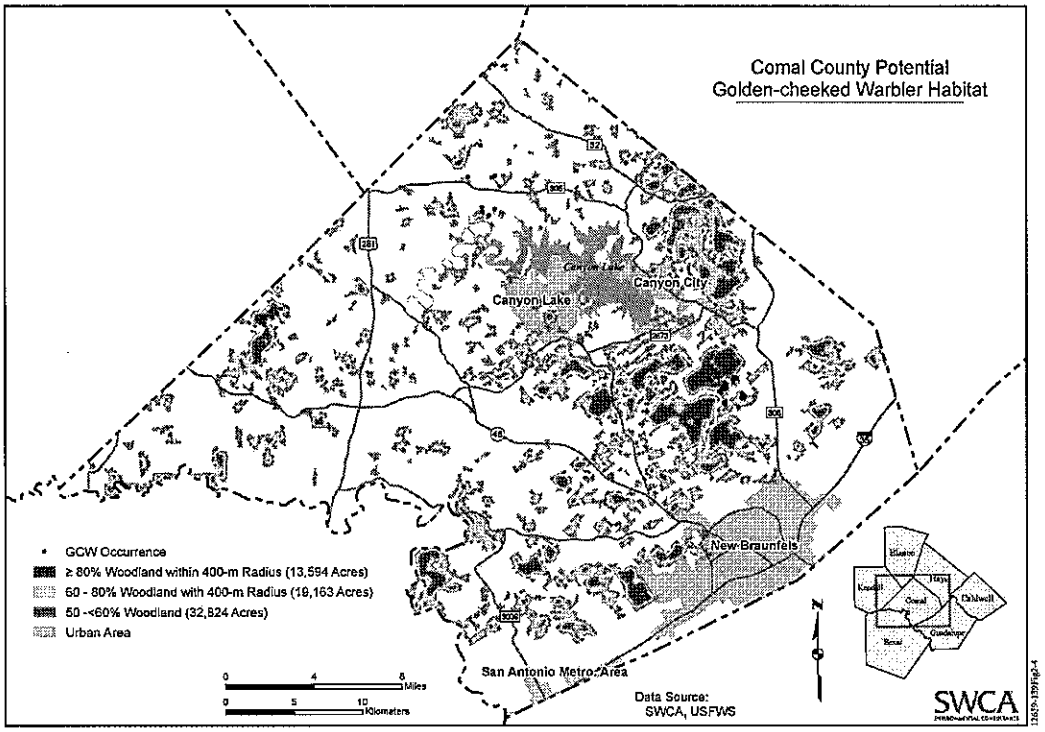

Figure 2-4. Golden-cheeked warbler (GCW) occurrences in Comal County, Texas, and distribution of potential habitat at 50-<60%, 60-<80%, and ≥ 80% woodlands composition within a 400-meter radius.

Table 2-1 summarizes the results of this delineation. Within Comal County, approximately 13,594 acres (5,501 hectares) have at least 80 percent woodland composition and at least a 50 percent probability of golden-cheeked warbler occupancy. This habitat is considered to have a relatively high probability of occupancy. Approximately 19,163 acres (7,755 hectares) have 60 to <80 percent woodlands and a 20 to <50 percent probability of golden-cheeked warbler occupancy. This habitat is considered to have a relatively low probability of occupancy. Approximately 32,824 acres (13,283 hectares) of potential golden-cheeked warbler habitat have 50 to <60 percent woodlands and a <20 percent probability of golden-cheeked warbler occupancy. This habitat is considered marginal.

Table 2-1. Estimated amount of woodland habitats at varying levels of percent composition and golden-cheeked warbler probability of occupancy in Comal County.

Percent Woodland Composition (color on Figure 2-4)	Percent Probability of Occupancy by Warblers	Acres of Potential Habitat (% of total)
≥80 (red)	≥50 (relatively high)	13,594 (20.7%)
60–<80 (yellow)	20–<50 (relatively low)	19,163 (29.2%)
50–<60 (green)	<20 (marginal)	32,824 (50.1%)
Total	-	**65,581 (100%)**

Golden-cheeked Warblers on Managed Lands. Approximately 1,592 acres (644 hectares) of the 65,581 acres of woodland in Comal County identified as potential golden-cheeked warbler habitat are contained in public and private protected lands. The principal protected areas are Honey Creek State Natural Area, Guadalupe River State Park, Bracken Bat Cave and Nature Reserve, and the Morton Preserve.

Honey Creek State Natural Area in western Comal County includes an estimated 857 acres (347 hectares) of golden-cheeked warbler habitat (Figure 2-5). Entry into the area is restricted to guided tours authorized by the TPWD, and the only facilities on the property are 2 miles (3.2 kilometers) of nature/interpretive trails.

Located adjacent to Honey Creek State Natural Area, Guadalupe River State Park straddles the boundary of Comal and Kendall Counties (Figure 2-5). Approximately 5 acres (2 hectares) of potential golden-cheeked warbler habitat are included in the Comal County portion of the state park. Surveys conducted by TPWD in 1995 and 1999 resulted in identification of 25 and 22 warbler territories in this total 862 acres (349 hectares) of habitat, respectively (M. Lockwood, TPWD, pers. comm. to SWCA on 20 June 2008). This equates to approximately 34.5 to 39.2 acres (14.0 to 15.9 hectares) of mapped habitat for every male or pair of warblers. These are simple densities based on acres of mapped habitat divided by number of birds; these densities are not equivalent to territory sizes of the birds.

Figure 2-5. Existing conservation areas in Comal County, Texas, golden-cheeked warbler (GCW) occurrences, and distribution of potential warbler habitat at 50–<60%, 60–<80%, and ≥80% woodlands composition within a 400-meter radius.

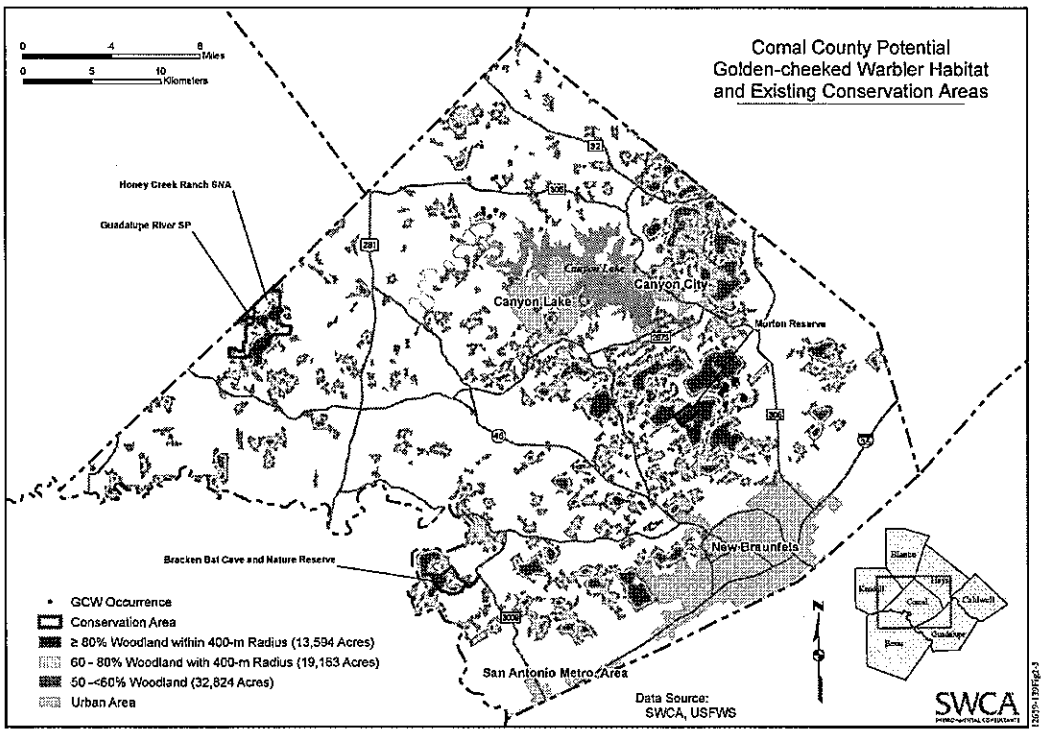

Figure 2-5. Golden-cheeked warbler (GCW) occurrences, existing conservation areas, and the distribution of potential habitat at 50-<60%, 60-<80%, and ≥ 80% woodlands composition within a 400-meter radius in Comal County, Texas.

Bracken Bat Cave and Nature Reserve is owned by the Bat Conservation International and managed primarily to protect a large colony of Mexican free-tailed bats (*Tadarida brasiliensis*) that roost in Bracken Bat Cave. Management goals also include restoring the property's vegetation community to a "more natural Hill Country landscape" (Bat Conservation International 2006). Located in south-central Comal County, the Bracken Cave preserve contains an estimated 442 acres (179 hectares) of potential golden-cheeked warbler habitat. Surveys conducted by SWCA indicate that five to six golden-cheeked warbler territories occur on this property (SWCA 2007). This equates to approximately 73.7 to 88.4 acres (29.8 to 35.8 hectares) of mapped habitat per male or pair of warblers.

The Morton Preserve is a 288.25-acre preserve owned by Comal County. Purchased using an ESA section 6 Recovery Land Acquisition Grant ($652,312), the Morton Preserve will be managed by the County and TPWD for the benefit of the golden-cheeked warbler and several other forest species. The Morton Preserve is situated within a much larger block of high-quality golden-cheeked warbler habitat (see Figure 2-5). The Nature Conservancy surveyed this property for golden-cheeked warblers in 2002 by listening for warblers at 14 randomly selected points spread across the property. Warblers were detected at 11 of 14 points, but no estimate of bird numbers was made (The Nature Conservancy 2002).

2.2.2 Black-capped Vireo (*Vireo atricapilla*)

The Service listed the black-capped vireo as endangered October 6, 1987 (52 FR 37420–37423). In June 2007, the Service recommended that the black-capped vireo be reclassified as threatened in its 5-Year Review of the species (USFWS 2007a), though no action has been taken by the Service in this regard.

2.2.2.1 Black-capped Vireo Natural History

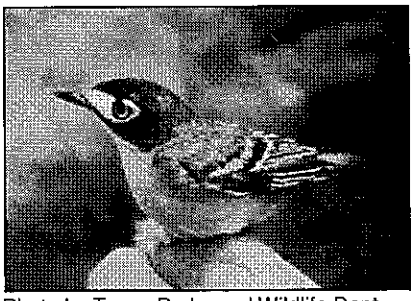
Photo by Texas Parks and Wildlife Dept.

The black-capped vireo occurs in western, central, and north-central Texas, a few localities in central Oklahoma, and in the states of Coahuila, Nuevo Leon, and Tamaulipas, Mexico (USFWS 1991, Farquhar and Gonzalez 2005). In central Texas, distribution of the black-capped vireo is restricted to habitats occurring west of the Balcones Escarpment. Black-capped vireos arrive in central Texas from late March to mid-April and generally return to their wintering grounds in September. The species winters primarily on the Pacific slope of western Mexico (Graber 1957, Marshall et al. 1984).

Breeding Habitat. Typical breeding habitat for the black-capped vireo consists of semi-open to relatively dense shrubland with vegetation cover down to ground level (Graber 1961). Grzybowski et al. (1994) characterized black-capped vireo habitat as having shrub cover of at least 35 percent and shrubby foliage present from ground level up to 6.6 feet (2 meters) in height.

Maresh (2005) documented a wider range of habitat usage, finding black-capped vireo territories in areas with woody cover ranging from less than 10 percent to greater than 90 percent with

canopy height greater than 19.7 feet (6 meters). However, Maresh reaffirmed that areas occupied by black-capped vireos consistently contained shrubby vegetation within 6.6 feet of the ground.

In central Texas, black-capped vireo habitat is usually dominated by shin oak or evergreen sumac (*Rhus virens*); other species often occurring in black-capped vireo habitat include Texas oak, plateau live oak, fragrant sumac (*R. aromatica*), prairie sumac (*R. lanceolata*), poison ivy (*Toxicodendron radicans*), Texas persimmon (*Diospyros texana*), agarita (*Mahonia trifoliolata*), redbud (*Cercis canadensis*), and Ashe juniper (Travis County 1999, Maresh 2005)

Black-capped vireo breeding habitat in central Texas is typically early to mid-successional. Therefore, black-capped vireo habitat currently present in the region has potential to become unsuitable for the species with time as shrubs become taller and are replaced by trees, which usually then create too much shade for understory foliage to be maintained at a level suitable for black-capped vireos. Historically, it is believed that wildfires allowed for creation of black-capped vireo habitat by damaging Ashe juniper while enhancing growth of fire-adapted oak and sumac species (Travis County 1999).

Breeding habitat for the black-capped vireo can be maintained naturally by wildfire, or artificially by mechanical clearing or with prescribed burns. Fire stimulates growth of certain shrubs and causes hardwoods to sprout new growth at the base of trees, thereby providing the low foliage cover required by black-capped vireos (Campbell 1995). Selective thinning of Ashe juniper, as well as mulching shrubs to ground level can be used to create or maintain vegetation of a structure suitable for black-capped vireos.

Geology, soils, and slope gradient and aspect can also influence the species composition and structure of woody vegetation communities. In general, thinner soil and rocky substrates allow shrubby communities to persist for longer periods of time. Steeper, south-facing slopes also often support shrubbier communities, sometimes indefinitely, because moisture availability can be too low to support trees. Shrub species preferred by the black-capped vireo occur most commonly, but not exclusively, on limestone substrates, with distribution of the black-capped vireo in central Texas correlating strongly with outcrop of the Fredericksburg Group of limestones (USFWS 1996b).

Territory Size. Male black-capped vireos generally establish territories that range in size from 1 to 10 acres (0.4–4.0 hectares). Average territory size is 2 to 4 acres (0.8–1.6 hectares; Graber 1957, Tazik and Cornelius 1989). Black-capped vireos often occur in clusters within patches of habitat, with the species apparently receiving benefit from increased social interaction as reproductive success is greater in larger groups of birds than in smaller groups (USFWS 1991).

Population Size. The total black-capped vireo population is unknown, owing to much of the range of the species in Mexico and Texas encompassing privately held lands that have not been surveyed. Black-capped vireo habitat can also be difficult to identify from satellite imagery or aerial photography, making it infeasible to first estimate extent of potential habitat and then apply an assumed occupation rate to reach a population estimate. Estimates of population size

are based on a limited but growing body of survey data, and those data suggest that populations of the black-capped vireo in its breeding range are increasing.

In 1991, the number of male black-capped vireos estimated to occur in Oklahoma and Texas was on the order of 1,000 (USFWS 1991). By 1995, that estimate had increased to around 1,800 (USFWS 1996b). In Oklahoma, as of 2005, the combined number of territories on the Wichita Mountains National Wildlife Refuge and Fort Sill was estimated to be in excess of 1,750 (USFWS 2005b). At least 6–7 territories were present in Cleveland County in 2004 (Shackford 2004), and 11–12 territories were present in Blaine County as of 2006 (J. Grzybowski, University of Central Oklahoma, pers. comm. to SWCA, 2006). In Texas, the number of male black-capped vireos was estimated to be approximately 9,200 in 2005 (Cimprich 2005, Maresh 2005). Of these, approximately 8,100 were estimated to occur on Fort Hood, and another 687 were estimated to occur on and west of the southwestern Edwards Plateau in Edwards, Kinney, Real, Terrell, and Val Verde Counties.

In Mexico, the population of black-capped vireos is poorly known and, as of 1995, was believed to be limited to Coahuila (USFWS 1996b), although the species had been documented in Nuevo Leon, San Luis Potosi, and Tamaulipas (Phillips 1911; Graber 1961; Marshall et al. 1984, 1985). Benson and Benson (1990) estimated that 3,139 to 9,463 pairs of black-capped vireos could be present in Coahuila based on extrapolation from limited surveys. Results of surveys from 2001 through 2005 by Farquhar and Gonzalez (2005) indicated presence of high densities of black-capped vireos in northern Coahuila, consistent with the estimates of Benson and Benson (1990). Farquhar and Gonzalez (2005) also confirmed presence of black-capped vireos in Nuevo Leon and Tamaulipas, and considered it likely that breeding populations of the species are extant in San Luis Potosi. Thus, the Mexican population may be greater and distributed more widely than was thought at the time of listing in 1987.

In June of 2007 the Service completed a "5-Year Review" of the black-capped vireo (USFWS 2007a). Findings of this review indicate that the overall breeding population of this species is substantially larger than was known at the time of the listing in 1987. At that time, the only known breeding locations accounted for fewer than 200 pairs, with a total estimated population of between 250 to 525 pairs (Marshall et al. 1985). Today the population in the United States and limited portions of the black-capped vireo's range in Mexico is estimated to comprise several thousand pairs (USFWS 2007a). From existing data, it is often difficult to determine whether the dramatic difference in numbers in the decade since the bird was listed is due to increased survey efforts or to substantial increases in natural reproduction. In many local situations, it could be that the increase in search efforts for the species has led to larger known populations. In other locations, however, evidence suggests that breeding populations have indeed increased. For example, in three of the four areas where good population density data were available a decade ago—Fort Hood Military Reservation (Texas), the Wichita Mountain Wildlife Refuge (Oklahoma), and Fort Sill Military Reservation (Oklahoma)—the known breeding populations have increased by almost 10 times (USFWS 2007a).

The conclusions of the 5-Year Review indicate that "...the current overall threat to the black-capped vireo is less in magnitude than it was at the time the species was listed. This is based on some threats decreasing in magnitude, the reconsideration of magnitude of certain threats, and

the effects of conservation measures on the major threats to the species" (USFWS 2007a:22). The review concludes with the recommendation that the species be reclassified from endangered to threatened status.

2.2.2.2 Primary Threats to the Black-capped Vireo

Primary threats to the black-capped vireo include direct destruction of breeding habitat, loss or deterioration of breeding habitat through natural processes, low reproductive success, and indirect effects of land use on breeding grounds (USFWS 1991). Low reproductive success has been attributed to high rates of nest parasitism by brown-headed cowbirds and nest predation by red imported fire ants (*Solenopsis invicta*) and other species. Habitat loss occurs through clearing of land for ranching or other agricultural practices, and browsing of low-level vegetation by goats and other domestic animals, and clearing for residential developments, road construction, placement of utilities, and other land uses. Suppression of wildfire likely causes potentially suitable black-capped vireo habitat to develop at rates below those of historical times. Potential impacts to wintering habitat are thought to be relatively understudied (Grzybowski et al. 1994). However, a recent study by Powell and Slack (2006) found that clearing of brush for grazing and/or other agricultural purposes was common throughout the Mexico winter range, but did not conclude that such disturbance "could be considered a serious problem for the species." Interestingly, this study also indicated that the species is more of a habitat generalist on the wintering grounds than it is during the breeding season (Powell and Slack 2006).

The striking increases in black-capped vireo numbers on Fort Hood, the Wichita Mountains National Wildlife Refuge, and Fort Sill is thought to have resulted from concerted management efforts, including creation of new habitat, management of existing habitat to negate loss through successional processes, and aggressive trapping of brown-headed cowbirds (USFWS 1996b, 2005b). Studies have indicated that female black-capped vireos raise from 0 to 2.25 young per year in areas where cowbirds are not controlled, but they can raise from 1.7 to 3.8 young per year in areas where cowbirds are controlled (USFWS 1996b).

On Fort Hood, where cowbirds are controlled and black-capped vireo nesting success is sampled annually, it was found that in 2005, 75.3 percent (232 of 308) of nests whose fates were known failed to produce fledglings (Cimprich 2005). Depredation was the leading cause of nest failure (186 of 232, or 80.2 percent). For those nests that were successful, the average number of fledglings produced per nest was approximately 1.17 (Cimprich 2005). In 2004, 53 percent of monitored black-capped vireo nests (n = 314) failed to produce fledglings, while successful nests produced an average of 3.22 fledglings per nest (Cimprich 2004).

2.2.2.3 Black-capped Vireo Recovery Plan

The Service prepared a Recovery Plan for the black-capped vireo in 1991 (USFWS 1991). Because of gaps in knowledge of the biology, ecology, and population status of the black-capped vireo at the time of its preparation, the Recovery Plan does not identify criteria for delisting of the species. Instead, it states that the black-capped vireo will be considered for downlisting to threatened when: 1) all existing populations are protected and maintained (for example, there is a protected population of black-capped vireo in the Balcones Canyonlands National Wildlife

Refuge, as well as on several state parks, including, for example, Kickapoo Cavern State Park, and Colorado Bend State Park); 2) at least one viable breeding population exists in Oklahoma, Mexico, and four of the six recovery regions delineated in Texas; 3) sufficient and sustainable area and habitat on the winter range exists to support the breeding populations; and 4) the previous three criteria have been maintained for at least five consecutive years, and available data indicate that they will continue to be maintained.

The Recovery Plan divided the breeding range of the black-capped vireo into six regions and placed Comal County within Recovery Region 3. In 1996, it was recommended that the six recovery regions for the black-capped vireo be revised to four and that Comal County be placed in the newly reconfigured Recovery Region 2 (USFWS 1996b), although this recommendation has not been adopted formally through issuance of a revised or amended Recovery Plan.[14] "Viable population" is defined in the Recovery Plan as 500 to 1,000 breeding pairs of black-capped vireos. A population and habitat viability assessment performed for the black-capped vireo indicated that the black-capped vireo has a very low probability of going extinct even in a population of 200 to 400 breeding pairs if fecundity of $\geq$1.25 female offspring per female is achieved, either naturally or through management (USFWS 1996b). As of 2005, viable populations of black-capped vireos, as defined by the Recovery Plan, were present in Oklahoma (Wichita Mountains Wildlife Refuge, with more than 1,250 pairs; USFWS 2005b) and Texas (Fort Hood in existing Recovery Region 2, with an estimated 13,000 pairs; USFWS 2005c).

2.2.2.4 Current Status of the Black-capped Vireo in Comal County

Currently, no records of black-capped vireo occurrence exist for Comal County, although suitable habitat is present. Extrapolating from the results of a roadside survey of two 30-mile (48-kilometer) transects in areas thought "most likely" to support black-capped vireos, Maresh and Rowell (2000) estimated that 3,591 acres (1,453 hectares) of black-capped vireo habitat exist in Comal County. The reliability of this estimate has been questioned by Wilkins et al. (2006), who concluded that the analysis lacked statistical rigor and likely overestimated the amount of suitable black-capped vireo habitat. Wilkins et al. (2006) warn that the results are of limited value for comparison purposes and should be interpreted with caution. More recently, Fuller et al. (2008) used a niche model to estimate the amount of black-capped vireo habitat in Comal County. They concluded that approximately 492 acres (199 hectares) of "good" black-capped vireo habitat exist in the County. This acreage total includes only the top 50 percent of sites identified as being suitable black-capped vireo habitat (i.e., the 50 percent of sites that best matched the environmental parameters associated with records of black-capped vireo occurrence).

Because Fuller et al. (2008) did not include all "suitable habitat" in their estimate, and because Maresh and Rowell (2000) likely overestimated the amount of black-capped vireo habitat in the County, the actual amount of potential black-capped vireo habitat in Comal County probably falls between 492 and 3,591 acres. SWCA did not attempt to delineate black-capped vireo

[14] All subsequent references in this document to black-capped vireo recovery regions are to those defined in the 1991 Recovery Plan.

habitat using GIS due to the difficulty inherent in attempting to identify black-capped vireo habitat from aerial photography.

2.3 EVALUATION SPECIES

At initiation of the RHCP the Evaluation Species will include the Cagle's map turtle and eight obligate cave-dwelling organisms. The eight cave-dwelling species include one decapod, two cave-obligate amphipods, a cave-obligate beetle, a cave-obligate harvestman, two cave-obligate spiders, and a snail (the nymph trumpet). The scientific names for these species are provided in Chapter 1, Section 1.1.1.1. All the Evaluation Species are known to occur, or are likely to occur, in Comal County. As the RHCP program proceeds, the status of these species will be monitored and assessed, and the list of Evaluation Species will be updated. As a result, some species may be dropped from the list and others may be added.

As stated in Chapter 1, the Evaluation Species will not be covered by the requested Permit, but they are perceived to be rare within the County and may be federally listed as threatened or endangered in the future. Conservation measures in the RHCP that may benefit and help to preclude the need to list some or all of the Evaluation Species include research, community educational efforts, and establishment of preserves for the Covered Species. Such conservation measures may also help facilitate obtaining incidental take coverage if these species become listed in the future and coverage for take is needed by the County. Should any of these species become federally listed in the future, they would only be covered by the requested Permit if the County applies for and the Service grants an amendment to the Permit. Prior to inclusion of any of the Evaluation Species on the Permit, an analysis of anticipated impacts would be performed (see Chapter 6, Section 6.1.3).

2.3.1 Cagle's Map Turtle

On April 8, 1991, Cagle's map turtle was petitioned to be listed as a federally endangered species (Killebrew 1991). In response to that petition, the Service designated the turtle as a candidate species on January 22, 1993, indicating that listing of the species was warranted, but precluded at that time because the Service lacked the resources to propose the species for listing (58 FR 5701). On November 16, 2000, the TPWD listed Cagle's map turtle as a State threatened species (Texas Register, Title 31, Chapter 65). On September 12, 2006, after reviewing the turtle's status, the Service announced that, because of stable population size, increased protection, and no foreseeable threats from reservoir construction, the listing of Cagle's map turtle was no longer warranted (71 FR 53767).

The historical range of Cagle's map turtle formerly encompassed the watersheds of the Guadalupe and San Antonio Rivers of south-central Texas (Dixon 1987, Conant and Collins 1991), but the species may now be extirpated in the San Antonio drainage (Vermersch 1992). Habitat for this turtle consists of limestone or mud-bottomed streams with moderate current and pools of varying depths, although it may also be found in slow-moving water behind impoundments (Vermersch 1992).

The primary threat to Cagle's map turtle is loss and degradation of riverine habitat resulting from construction of dams and reservoirs, although the species is also vulnerable to over-collecting for the pet trade, zoos, museums, and scientific research (Killebrew 1991). The naturally limited distribution of this turtle makes the species more vulnerable to extinction than other wider-ranging species. Location and suitability of nesting sites may be impacted by alteration of a single river system and, such impacts may, in turn, affect hatch rates and sex ratios (Wibbels et al. 1991).

2.3.2 Eight Obligate Cave-Dwelling Invertebrate Species

The eight cave-obligate species addressed in this RHCP are considered Evaluation Species because they were included in a recent listing petition submitted to the Service by the Forest Guardians (2007), an environmental advocacy group. All eight species are also ranked as imperiled or critically imperiled by NatureServe (2008). The eight species are vulnerable to impacts from development activities due to their absolute dependence on environmental conditions present only in caves. The cave environment is characterized by stable temperatures close to the mean surface temperature, constant near-saturation humidity, low evaporation rates, and the absence of photosynthetic nutrient production (Barr 1968, Culver 1982). Due to the lack of light for photosynthesis, most cave communities lack primary producers. Instead they rely on nutrient input from the surface ecosystem, and as such they are an extension of the surface ecosystem. The health of karst ecosystems is governed by the natural quantity and quality of groundwater, energy brought into the ecosystem via caves and other karst features (i.e., flood debris representative of a healthy surface plant and animal community), and normal water flow regimes. Because a healthy subsurface environment depends on a healthy surface environment, karst terrains are extremely sensitive to degradation from human activities. Within Comal County, caves in five bedrock outcrops provide habitat for terrestrial and aquatic cave-dwelling species. From youngest to oldest these formations are the main outcrop of the Edwards Aquifer (Georgetown, Person, and Kainer Formations), outliers of the Kainer Formation, the upper and lower members of the Glen Rose Formation, the Hensell Formation, and the Cow Creek Limestone.

Very few specimens of the eight cave-obligate Evaluation Species have been collected, so their distribution and population sizes are unknown. Given that very little is known about these species, it is not surprising that the Service's 90-Day Finding (74 FR 419) in response to the Forest Guardians petition indicated that insufficient information was presented in the petition to support listing the following six species:

- a cave-obligate amphipod (*Seborgia hershleri*)
- a cave-obligate beetle (*Rhadine insolita*)
- a cave-obligate harvestman (*Texella brevidenta*)
- a cave-obligate spider (*Cicurina puentecilla*)
- a cave-obligate spider (*Cicurina reclusa*)
- a snail (nymph trumpet; *Phreatoceras taylori*)

No further action on these six species will be taken by the Service until or unless additional information is submitted to them requiring additional consideration. The Service has yet to issue

a finding on whether sufficient information was presented in the petition to warrant listing the two remaining cave-obligate Evaluation Species: *Palaemonetes holthuisi* and *Texiweckelia relicta*. All eight cave-obligate are still included in the RHCP as Evaluation Species.

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CHAPTER 3 – COVERED ACTIONS

3.1 AUTHORIZED ACTIONS

Upon issuance of the Permit, take of Covered Species associated with the following activities occurring in the County would be authorized under and in accordance with this RHCP:

- Public or private construction and development.
- Utility installation and maintenance, including but not limited to power and cable stations, substations, and transmission lines; water, sewer, and natural gas pipelines; and other facilities.
- Public infrastructure projects such as school development, road construction and maintenance, and development of parks.

This RHCP is not intended to restrict or address ordinary farm and ranching practices; however, participation in the RHCP may be granted for brush control programs that are determined to potentially impact Covered Species habitat.

The County has experienced rapid population growth in the last decade, and growth is expected over the life of the RHCP, but at a somewhat lower rate. Over the next 30 years, the population is projected to increase by 78 percent (Table 3-1, Figure 3-1).

Table 3-1. Population forecast in five-year increments, 2009–2039, for Comal County, Texas.

Year	County Population Forecast
2009	113,224
2014	128,149
2019	141,853
2024	155,801
2029	170,787
2034	186,107
2039	202,500

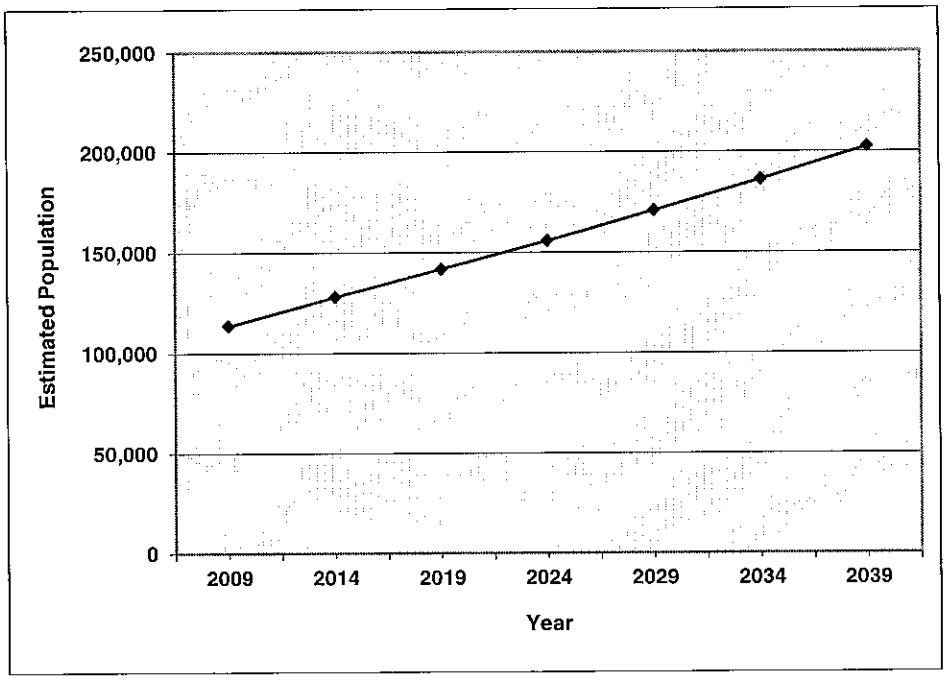

Figure 3-1. Projected population growth in Comal County, 2009–2039.

Infrastructure improvements, public and private development and construction projects, and other development activities are expected to continue as the population grows. The landscape of the County will continue to change as new development activities are carried out. The activities authorized under this RHCP are expected to impact the Covered Species in the County. Primary impacts will be disturbance, alteration, or removal of habitat. Impacts to Covered Species may occur if development and construction result in destruction of occupied habitat. Species may also be indirectly impacted by negative changes in habitat quality, which may occur due to removal of existing vegetation, alteration of drainage patterns, increased habitat fragmentation, increased populations of predatory, invasive, or competitive species, and other indirect effects of clearing activities.

This RHCP assumes that 20 to 50 percent of total potential golden-cheeked warbler habitat loss within the County over the life of the Permit will be covered under the Permit and this RHCP. That is, for planning purposes we have made the assumption that 20 to 50 percent of all development impacting potential species habitat in Comal County over the 30-year life of the RHCP will be authorized through this RHCP.

The level of expected voluntary participation in the RHCP is impossible to predict with precision at this time because few data are available from previous efforts. The one example available is the Balcones Canyonlands Conservation Plan in Travis County, but the circumstances surrounding that plan are very different from those in Comal County. Landowner enrollment in the Travis County plan has averaged less than 10 percent participation (K. Connally, Balcones Canyonlands Conservation Plan, pers. comm. to SWCA, 2008). We expect the Comal County RHCP to attract more participants than Travis County's plan for several reasons. First, Travis County has had a low participation rate in part because prolonged controversy stretched plan development over a very long period; the entire process from initiation to the final authorization

took nearly a decade to complete. This was a period of very rapid growth, and many landowners had pursued and acquired individual section 10(a)(1)(B) permits before the regional plan could be finalized. In contrast, the Comal County RHCP is being started earlier in the population growth curve for the planning region and is generating less controversy. We also have the advantage of learning from the Travis County experience and anticipate a much shorter timeframe from plan initiation to authorization.

Other factors that will encourage more participation from Comal County landowners in the RHCP than was realized in Travis County is the long average time for completion of individual section 10(a) permits today compared to a decade ago. Individual permits today often take over two years from permit application to actual signing of the Permit. Given this long timeframe, landowners in Comal County are less likely to pursue individual permits than did their counterparts in Travis County a few years ago. With the RHCP in place, participant applications are likely to be approved in three months or less. Avoiding lengthy project delays is expected to be a strong incentive for landowner participation in the Comal County RHCP. In addition, the landowner community is far more aware of ESA requirements and the need for compliance than was apparent a decade ago. Finally, the costs for participation in this RHCP are expected to be generally less than the costs of obtaining individual permits. Given these circumstances, it is not unreasonable to assume that the RHCP participation rate in Comal County will exceed that seen in Travis County.

The Service recently (2011) approved an RHCP in Texas, the Hays County RHCP, which assumes a participation rate of 33 percent for the private sector and 75 percent for the public sector. In an RHCP approved earlier (2008) by the Service, the Williamson County RHCP, the participation rate was assumed to be 20 percent, the low end of the range anticipated for Comal County. In Williamson County, an estimated 15 percent of private residential and 100 percent of public sector projects with potential Covered Species habitat have participated in the RHCP to date (G. Boyd, Director of Environmental Services, Williamson County, pers. comm. to SWCA, 2012).

Anticipating the level of participation is an important, but not critical, factor in estimating the amount of impact, or "take," that will be authorized by the proposed incidental take permit and mitigated for by the RHCP conservation measures. As stated earlier in this chapter, to ensure that the proposed measures are adequate to mitigate for the actual level of take eventually authorized under the Permit, this RHCP assumes a participation rate of 50 percent.

It is possible that demand for participation in the proposed RHCP will exceed 50 percent. This is possible for two reasons. First, the estimate of future development within potential habitat may be conservative. For example, it may not account for larger-scale clearing of ranches in anticipation of development even where that development is not imminent. Similarly, the model allocates impacts with the construction of new rooftops, but the practical reality is that the impact associated with a large number of rooftops often happens over a brief period of time, even though actual construction may continue for years. Second, it is possible that participation rates will be higher than the 50 percent of habitat loss projected for the purposes of the Proposed Alternative. For these reasons, a component of the proposed RHCP is the possible future amendment of the Permit to authorize additional take and mitigation as may be necessary to meet

actual demand. Such a Permit amendment could be sought by the County during the term of the original Permit at its discretion, as events warrant. Such a Permit amendment would be a "major" amendment requiring additional analysis under NEPA, and an additional opportunity for public comment. With respect to any such future amendment to the Permit, the County would be responsible for conducting any required analysis. The Service would provide technical assistance and timely processing.

It should be clearly understood that the 20 to 50 percent participation assumption is only that, an "assumption." Incidental take authorized by the Permit will be measured by the number of acres of potentially occupied golden-cheeked warbler and black-capped vireo habitat disrupted or removed[15] (see Sections 3.2 and 3.3, respectively), up to the maximum number of acres authorized in the proposed Permit. The proposed conservation measures described in Chapter 4 are designed to mitigate to the maximum extent practicable for the level of take eventually authorized under the Permit. The mitigation habitat will be preserved in larger, less fragmented parcels than the impacted habitat and will be managed for the listed species in perpetuity. The mitigation ratio will be at least 1:1 for direct impacts. See Chapter 4, Sections 4.3.1.3 and 4.4.1.2 for a detailed description of the conservation measures for the golden-cheeked warbler and the black-capped vireo, respectively.

3.2 IMPACTS OF COVERED ACTIONS ON GOLDEN-CHEEKED WARBLER

3.2.1 Types of Impacts That May Result from Covered Actions

Incidental take of golden-cheeked warblers authorized under this RHCP may occur through removal and/or fragmentation of suitable habitat and related direct, indirect, and cumulative effects. Clearing of vegetation identified as golden-cheeked warbler habitat on parcels participating in the RHCP would be allowed only during the non-breeding season (August 1–February 29), when most golden-cheeked warblers are on their wintering range, or are in transit to or from these areas in Mexico and Central America. This restriction pertains unless a breeding season survey performed according to Service protocols by an ESA section 10(a)(1)(A)-permitted biologist indicates that no golden-cheeked warblers are present within 300 feet (91 meters) of the desired activity.

Regardless of the presence or absence of the golden-cheeked warbler, the loss of oak-Ashe juniper woodlands that constitute the species' nesting habitat could result in loss of carrying capacity and in population reductions. In addition to habitat loss, habitat fragmentation resulting from actions authorized under this RHCP may diminish habitat quality. Fragmented habitat results in smaller patch sizes and a greater amount of "edge," which may increase predation and nest parasitism and negatively impact dispersal and reproductive success of birds (Lovejoy et al. 1986, Wilcove et al. 1986, Wahl et al. 1990, Saunders et al. 1991).

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[15] As explained in Chapter 5, Sections 5.2.1 and 5.2.2, if a participant elects not to have bird surveys conducted to verify presence or absence of the listed species to ascertain the numbers of pairs, or territories, impacted by a project, take will be measured in acres of potential warbler or vireo habitat disturbed.

The projected human population growth in Comal County is likely to result in urban development occurring within and in close proximity to golden-cheeked warbler habitat. Urban development is often accompanied by increases in generalist species, or species that are successful within a wide range of habitats. Increases in species that are habitat generalists (e.g., grackles [*Quiscalus* spp.], jays [*Cyanocitta* spp.], mice [*Peromyscus* spp.], and fox squirrels [*Sciurus niger*]) often occur at the expense of species with more specialized habitat requirements. Possible introduction and/or increase of predators such as house cats and jays, or an increase in the number of brown-headed cowbirds (a brood parasite), can also have a negative impact on nesting birds (Sexton 1987).

3.2.2 Estimating Levels of Take Resulting from Covered Actions

As noted above, activities covered by this RHCP are expected to result in a reduction of total potential habitat for the golden-cheeked warbler and the black-capped vireo. Habitat is needed to support essential behavioral patterns, including breeding, feeding, and sheltering, and loss of habitat has the potential to harm the golden-cheeked warbler and black-capped vireo by impairing these essential functions. However, not all land development activities will affect the Covered Species due a number of factors, including the probability that not all areas identified as potential habitat are actually occupied by the species and the implementation of measures during the land development process that avoid impacting potential habitat. Incidental take of the Covered Species under the RHCP will be measured in terms of the direct and indirect impacts to acres of potential habitat resulting from activities covered by this RHCP. Impacts to habitat will be used as a proxy for impacts to individual birds, breeding pairs, or territories because reliable estimates of the total population of warblers and vireos in Comal County are not available. Using habitat as a proxy for take of individual golden-cheeked warblers and black-capped vireos is consistent with the Service's approach with respect to both birds, and has been utilized in myriad incidental take permits and ESA section 7 consultations with respect to those species. This approach also appears consistent with the limited case law addressing the issue of habitat as a proxy. For example, in *Arizona Cattle Growers' Association v. U.S. Fish and Wildlife Service*, the Ninth Circuit Court of Appeals held that the use of ecological conditions, such as impacting acres of potential habitat, may be used as a surrogate for defining the amount or extent of incidental take so long as these conditions are linked to the take of the covered species (273 F.3d 1229, 1249-50 [9th Cir. 2001]; see also *Oregon Natural Resources Council v. Allen*, 476 F.3d 1031, 1037 [9th Cir. 2007]).

Identifying the specific number of birds that fail to reproduce or die due to lack of food or shelter is not possible; biologists do not and cannot band and track the movements of every affected bird. Therefore, quantifying "take" that may result from the covered actions in this RHCP in terms of a specific number of individual golden-cheeked warblers or black-capped vireos is impracticable. Because expressing the numerical value of take of individual golden-cheeked warblers and black-capped vireos is impracticable, as described in greater detail below, the RHCP expresses take as the number of acres of potential habitat for the covered species that will be impacted, directly or indirectly, by covered activities.

While surveys for the golden-cheeked warbler and black-capped vireo provide valuable information for determining the extent of occupation of a given area, they do not provide a

precise mechanism for predicting the number of golden-cheeked warblers or black-capped vireos that may actually be "taken" by the proposed action. The effectiveness of bird surveys in counting the number of birds in an area can be somewhat limited. For example, males of the Covered Species are far more easily observed than females or fledglings during surveys, due to their frequent vocalizations. Moreover, the acreage of habitat impacted or protected by a particular action is a relatively stable metric of take and mitigation, compared to the number, size, and location of individual bird territories on a property that may vary from year to year. In addition, the impacts of a given activity may not be fully felt in a single season and may be spread over several or even many years, during which utilization of a given area may vary significantly for reasons unrelated to the activity in question. This variability is influenced by species preferences or environmental factors that may include natural year-to-year variations in the precise habitat utilized by individual birds, variations in individual bird behavior that influence detectability, variations in the ability of surveyors to detect and accurately map individual birds, and survey methodology. Therefore, estimates of take and mitigation based on impacts to territories as delineated by surveys in any given year are highly variable. For these reasons, it is not possible to predict the precise number of golden-cheeked warblers or black-capped vireos that may, over time, be "taken" or "preserved" as a result of the activities covered by or the mitigation measures to be taken pursuant to the RHCP. Therefore, take and mitigation in this document are not characterized by a precise number of golden-cheeked warblers and black-capped vireos, but by the loss or permanent preservation of habitat for the those species, the relative quality of which is determined primarily by an on-site assessment of vegetative characteristics that may influence occupancy of habitat by the Covered Species.

3.2.3 Estimated Loss of Golden-cheeked Warbler Habitat

While it is expected that many areas of currently undisturbed woodland containing habitat for the golden-cheeked warbler will be subject to some form of development over the life of the RHCP, not all of this habitat will necessarily be irrevocably impacted, or indeed, impacted at all. Three lines of reasoning allow this conclusion. First, one of the primary objectives of this RHCP will be to assist landowners in avoiding golden-cheeked warbler habitat when possible; second, participation fees ($7,500/acre initially[16]) may encourage avoidance; and third, good golden-cheeked warbler habitat is often in steep canyons (Campbell 2003, TPWD 2006), where development is difficult under the best of conditions.

Table 3-2 summarizes the analysis developed by Texas Perspectives and Capitol Market Research to estimate the total number of acres of golden-cheeked warbler habitat that may be impacted by future population growth and land development in Comal County. Because the expected future population growth and development will not be evenly distributed across the County, potential impacts were analyzed separately for each of the 11 U.S. census tracts within the County (Figure 3-2).

[16] Mitigation costs will change through time to reflect inflation, RHCP costs, and other economic factors.

Table 3-2. Analysis of projected land development potential impacts on golden-cheeked warbler habitat in Comal County, 2009–2039.

Census Tract	3101	3102	3103	3104.01	3104.02	3105	3106.01	3106.02	3107	3108	3109	Total
Developable Acres[1]	16	278	577	125	1,717	2,992	65,076	23,123	81,962	40,980	67,149	283,995
Percent warbler habitat of developable acres in tract	0%	0%	8%	0%	0%	0%	22%	28%	17%	27%	29%	23%
Warbler habitat (acres)[2]												
≥ 80% woodland	0	0	0	0	0	0	2,634	844	1,689	2,542	5,886	13,594
60–80% woodland	0	0	1	0	0	0	4,534	1,311	3,209	3,999	6,109	19,163
50–<60% woodland	0	0	44	0	0	0	7,342	4,423	8,962	4,594	7,448	32,812
Total	0	0	44	0	0	0	14,511	6,577	13,860	11,134	19,443	65,568
Net new individuals[3]	1,086	1,344	2,670	1,591	3,941	10,297	14,327	12,019	32,342	16,324	24,995	120,933
individuals per residence[3]	2.4	2.5	2.2	3.2	2.7	2.7	2.5	2.4	2.9	2.9	2.8	
Net new residences	449	542	1,203	505	1,487	3,871	5,641	5,071	11,269	5,668	8,863	44,569
Residences per acre[3]	3.5	3.5	3.5	3.5	3.5	3.5	0.5	0.5	0.5	1	1	
Acres consumed by residences	128	155	344	144	425	1,106	11,281	10,143	22,538	5,668	8,863	60,795
Total acres consumed[4]	239	270	539	306	703	2,150	13,535	13,052	27,264	10,071	14,425	80,429
Warbler habitat potentially impacted (acres)												
≥ 80% woodland	0	0	0	0	0	0	548	476	562	625	1,264	3,475
60–80% woodland	0	0	1	0	0	0	943	740	1,067	983	1,312	5,046
50–<60% woodland[5]	0	0	8	0	0	0	305	499	596	226	320	1,955
Total habitat impacted	**0**	**0**	**9**	**0**	**0**	**0**	**1,796**	**1,715**	**2,225**	**1,833**	**2,897**	**10,476**

[1] Developable acres = vacant land and pasture and crop land.

[2] Habitat categories: ≥ 80% Woodland = relatively high probability of occupancy habitat; 60–80% Woodland = relatively low probability of occupancy habitat; 50–<60% Woodland = marginal habitat. Source: SWCA; see Section 2.2.1.4 for information on the delineation of golden-cheeked warbler habitat in Comal County.

[3] Source: Texas Perspectives and Capitol Market Research proprietary data. Allocation of population growth by census tract was adjusted to take into account planned subdivisions, the amount of total land available for development, septic permit activity, and recent trends in commercial development.

[4] Acres consumed were adjusted upward to include estimated commercial and roadway construction accompanying residential development (Texas Perspectives and Capitol Market Research proprietary data). Acreage for Census Tract 3109 includes estimated construction impacts of the proposed New Braunfels outer loop.

[5] For purposes of estimating take associated with acres of habitat impacted, it is assumed that only 20% of impacted marginal habitat (50–<60% woodland) would result in take of the warbler because such habitat has less than a 20 percent probability of warbler occupancy.

Figure 3-2. Distribution of golden-cheeked warbler habitat and existing platted subdivision development in Comal County by census tracts.

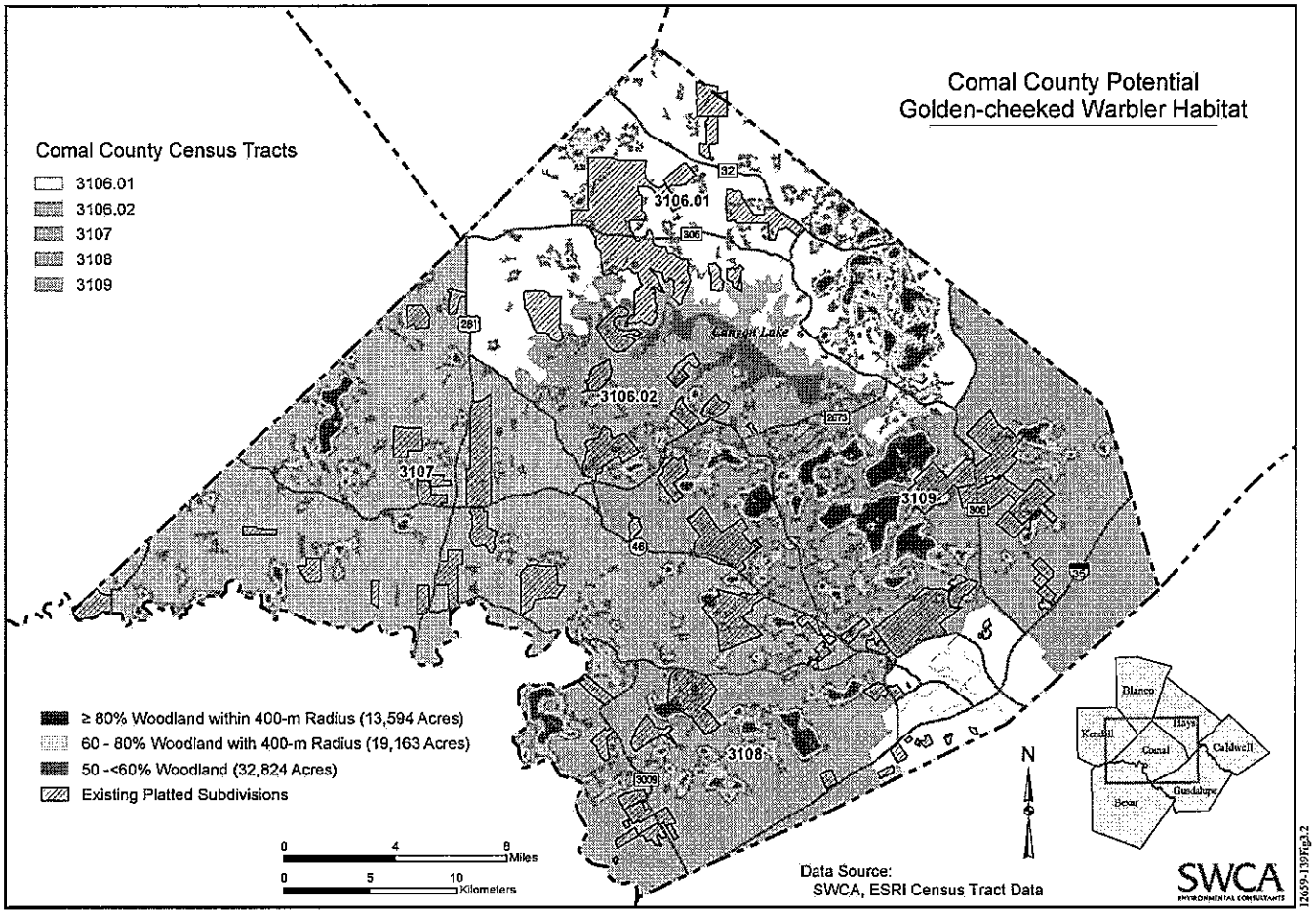

Figure 3-2. Distribution of golden-cheeked warbler habitat and existing platted subdivision development in Comal County by census tracts.

For each census tract, the data considered included the estimated amount of developable land, the estimated amount of golden-cheeked warbler habitat by probability of occupancy,[17] and the level and distribution of future human population growth and land development. The analysis of future population growth incorporated a suite of historical data, including residential and employment growth, household size, residences per acre, septic tank permit data, general land use patterns, and existing and future infrastructure (including transportation projects). Future large-scale developments such as master-planned communities were identified, and forecasts of relevant economic and demographic variables provided by the Texas State Data Center and Texas Water Development Board were reviewed.

Once the population growth for each census tract was estimated ("net new individuals" in Table 3-2), the number of acres of developable land consumed by residences was calculated using current household density and acreage-per-housing-unit data. The resulting acreage was then adjusted upward to include estimated commercial and roadway construction accompanying residential development ("total acres consumed" in Table 3-2). In the final step of the analysis, the impact of all development in the County (not just that covered by this RHCP) on golden-cheeked warbler habitat was estimated based on the percentage of existing habitat found in each census tract ("percent warbler habitat" in Figure 3-2).

As shown in Table 3-2, the total amount of golden-cheeked warbler habitat expected to be impacted within the County over the next 30 years is 10,476 acres (4,239 hectares). Of this, 3,475 acres (1,406 hectares) are in "relatively high probability of occupancy habitat," 5,046 acres (2,042 hectares) are in "relatively low probability of occupancy habitat," and 1,955 acres (791 hectares) are in "marginal habitat." The majority of this impact is expected to occur in the five census tracts north and west of New Braunfels.

As explained in Section 3.1, above, this RHCP assumes a participation rate of 20 to 50 percent. This means that 20 to 50 percent of the development in 10,476 acres of habitat, or 2,095–5,238 acres (848–2,120 hectares), will likely be impacted by RHCP participants. The County is basing its calculations in this RHCP on the high end of that range (a participation rate of 50 percent), and is therefore requesting a Permit to cover the incidental take associated with the loss of 5,238 acres of golden-cheeked warbler habitat over the 30-year life of the RHCP.

Attempting to estimate how many golden-cheeked warbler territories are represented by 5,238 acres of variable quality habitat is conjectural at best. Assuming that 20 to 80 acres (8 to 32 hectares; Pulich 1976) are required for each golden-cheeked warbler territory, the range of possibly affected golden-cheeked warbler territories may be from 65 to 262 territories. It should be kept in mind that other studies have reported a range of territory densities from 3.3 to 50 acres/pair (Kroll 1980, Wahl et al. 1990, USFWS 1996a, Travis County Natural Resources Division 2004; see Chapter 2, Section 2.2.1.1). This broad range further emphasizes that any estimate of golden-cheeked warbler numbers based on assumed density is highly speculative.

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[17] As described in Chapter 2, Section 2.2.1.4, potential golden-cheeked warbler habitat in Comal County was categorized into the following three habitat quality levels based on known or perceived probability of habitat occupancy by warblers: ≥ 80% Woodland = relatively high probability of occupancy habitat; 60–80% Woodland = relatively low probability of occupancy habitat; 50–<60% Woodland = marginal habitat.

Nonetheless, using estimated density is the only technique available for estimating numbers of birds potentially affected. In the case of Comal County, the inherent uncertainty associated with this technique is exacerbated by the fact that very little information is available on golden-cheeked warbler density anywhere in the County. Through management of the RHCP and reporting to the Service, the County and the Service will be able to track the amount of golden-cheeked warbler habitat impacted under the RHCP to ensure that the level of take authorized under the Permit is not exceeded; however, the actual number of golden-cheeked warblers affected cannot be known.

3.3 IMPACTS OF COVERED ACTIONS ON BLACK-CAPPED VIREO

Although no records exist to date of black-capped vireos in Comal County, the species is reasonably certain to occur there. Potential black-capped vireo habitat has been identified in the County (Maresh and Rowell 2000, Fuller et al. 2008), and black-capped vireos have been documented from neighboring Hays, Blanco, Kendall, and Bexar counties (Wilkins et al. 2006).

Actions authorized under the RHCP may impact the species through habitat removal, increased nest parasitism, and nest depredation. Loss of black-capped vireo nesting habitat within the County is expected to be small. The incidental take of black-capped vireos in Comal County is not likely to be a major issue over the 30-year life of the RHCP. Still, some incidental take of the black-capped vireo is reasonably certain to occur, and an estimate of that take must be made for purposes of this RHCP.

As explained in Chapter 2, Section 2.2.2.4, the amount of potential black-capped vireo habitat in Comal County likely falls between 492 and 3,591 acres. In the absence of more precise data, the RHCP will seek an incidental take permit allowing for up to 1,000 acres of black-capped vireo habitat to be taken over the life of the RHCP. Because so little is currently known about the black-capped vireo's status and habitat distribution in Comal County, it is not reasonable to speculate on how many territories of what size this potential habitat might support.

3.4 CUMULATIVE IMPACTS

Cumulative impacts can be defined as "...the impact on the environment which results from the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant actions taking place over a period of time" (NEPA regulations at 40 CFR § 1508.7). Thus, cumulative impacts on the Covered Species include not only the impacts of the proposed RHCP, but those impacts that have already occurred and those impacts that are not related to the RHCP, but are reasonably likely to occur over the life of the RHCP.

3.4.1 Cumulative Impacts on Golden-cheeked Warbler

The cumulative impact on golden-cheeked warblers of the RHCP combined with previously authorized incidental take is summarized in Table 3-3. Impact is expressed in acres of golden-cheeked warbler breeding habitat modified or lost due to the covered actions. Unauthorized

clearing of golden-cheeked warbler habitat and possibly black-capped vireo habitat has likely occurred in the past in Comal County, as it has throughout central Texas; however, the location and extent of such clearing is unknown and is not included in the following analysis.

The entire breeding range of the golden-cheeked warbler contains 1,363,807 acres (SWCA 2007).[18] Assuming an average of 50 acres per pair (based on Pulich's [1976] estimate of 20- to 80-acre territory size), this habitat supports an estimated 27,000 golden-cheeked warbler pairs. The loss of golden-cheeked warbler habitat (5,238 acres) authorized under this RHCP represents a maximum of approximately 0.4 percent of total habitat as estimated by the Service (5,238 acres/1,363,807 acres). The maximum number of golden-cheeked warbler breeding territories (262) that may be affected by loss of 5,238 acres of habitat represents 1.0 percent (262/27,000 x 100) of the total estimated number of territories.

Table 3-3. Cumulative impact on golden-cheeked warblers and black-capped vireos of the RHCP combined with previously authorized incidental take.[1]

Species	Acres of Breeding Habitat in Texas (hectares)	Acres of Take Requested in RHCP (hectares)	% of Total Habitat	Acres of Previously Authorized Take (hectares)[2]	% of Total Habitat	Acres of RHCP & Previously Authorized Take (hectares)	% of Total Habitat
Golden-cheeked Warbler	1,363,807[3] (551,913)	5,238 (2,120)	0.4	38,804 (15,703)	2.8	44,042 (17,823)	3.2
Black-capped Vireo	1,450,000[4] (586,794)	1,000 (405)	0.1	7,567 (3,062)	0.5	8,567 (3,467)	0.6

[1] These estimates do not include take requested in the draft Hays County RHCP (see text Sections 3.4.1 and 3.4.2).
[2] Data for previously authorized take were derived from the Service's Southwest Region on-line electronic library (USFWS 2007b).
[3] Source: SWCA 2007
[4] Source: Wilkins et al. 2006, USFWS 2007a

Other habitat conservation plans and incidental take permits authorized by the Service throughout the golden-cheeked warbler's breeding range account for additional loss of golden-cheeked warbler habitat. Most of that authorized take (26,753 acres; 10,826 hectares) is in Travis County; however, the established preserves encompassing almost 30,000 acres (12,141 hectares) of prime habitat in Travis County are assumed to fully mitigate for authorized take in that county. To calculate the total number of estimated acres and territories of the golden-cheeked warbler that have been previously authorized by the Service for take, the Service's Southwest Region on-line electronic library was queried for all HCPs and Biological Opinions posted for this species (USFWS 2007b). As a result of this search, it was determined that in 152

[18] Three other recent estimates of total potential golden-cheeked warbler habitat in Texas are vastly higher—4,378,418 acres (Diamond 2007), 4,149,478 acres (Loomis Austin 2008), and 4,146,428 acres (Mathewson et al. 2012). These higher estimates are due to the inclusion of woodland habitat with a low probability of supporting warblers, habitat not included in the estimates calculated by SWCA (2007). If one were to use the higher habitat estimates, the potential cumulative impacts of the RHCP would appear to be much lower.

separate Federal actions, a total of 38,804 acres, supporting approximately 2,124 territories have been permitted for incidental take. This represents approximately 2.8 percent of the estimated available habitat for the golden-cheeked warbler (38,804/1,363,807 x 100). If the 0.4 percent of the habitat identified for take through this RHCP is added to the estimate of take previously authorized, approximately 3.2 percent of the available species known breeding habitat will have been authorized for removal.

Using the delineation methods described in Chapter 2, Section 2.2.1.4, SWCA has estimated that approximately 244,106 acres of potential golden-cheeked warbler habitat are present in Recovery Region 6 (SWCA unpublished data). The loss of golden-cheeked warbler habitat (5,238 acres) proposed for authorization under this RHCP represents a maximum of approximately 2.1 percent of that habitat (5,238/244,106 x 100).

The estimated number of breeding territories cumulatively authorized to be taken through previous actions (a maximum of 2,124 territories) plus the RHCP (a maximum of 262 territories) represent approximately 8.4 percent (2,262/27,000 x 100) of the entire known breeding territories. These numbers do not include past unauthorized take, which is unknown. Nor do they include other (besides Comal and Hays Counties) currently active incidental take permit applications being considered by the Service.

Future actions that are likely to affect golden-cheeked warbler breeding habitat and territories are impossible to predict with any precision. However, within the 35 counties identified as containing golden-cheeked warbler breeding habitat (USFWS 1992), human population growth is expected to increase by approximately 40 percent over the life of the RHCP (Texas State Data Center and Office of the State Demographer 2007). While it is not possible to project how much of this growth will occur in golden-cheeked warbler habitat, a 40 percent increase in population and associated development is expected to result in a cumulative loss of golden-cheeked warbler habitat.

Concurrent with the development of the Comal County RHCP, Hays County, immediately north of Comal County, developed a similar RHCP that will impact warbler and vireo habitat. The expected take of golden-cheeked warbler habitat in Hays County is 9,000 acres (3,642 hectares) or 0.7 percent of the estimated available habitat (9,000/1,363,807 x 100). Combined with the Comal County RHCP, these two plans will impact 1.1 percent of the remaining available habitat throughout the species range. Bexar County, immediately south of Comal County, is also initiating an RHCP planning process; however, there are no take estimates available at this time.

Loss of 5,238 acres of golden-cheeked warbler habitat under the RHCP adds to that Service-approved cumulative loss of habitat. It must be kept in mind, however, that in the case of the RHCP, adverse impacts that occur under the RHCP are no different than adverse impacts without the RHCP. The 5,238 acres of golden-cheeked warbler habitat are expected to be lost in either case, and under No Action the loss may or may not be mitigated, depending on whether landowners comply with the ESA.

The critical difference between No Action and the RHCP is that each acre of habitat taken will be mitigated by at least an acre of potential golden-cheeked warbler habitat acquired and

preserved in perpetuity. The more golden-cheeked warbler habitat that is protected from development over the long term, the greater the likelihood that the species will be conserved. Compared to what would likely occur without the RHCP, the permanent preservation of habitat under the RHCP, combined with a greater awareness in the County of ESA compliance options and the need for species conservation, may, in fact, result in less cumulative impact to the golden-cheeked warbler.

3.4.2 Cumulative Impacts on Black-capped Vireo

The breeding range of the black-capped vireo in the United States (four percent of the known breeding population resides in Mexico) comprises almost 34 million acres (13,759,611 hectares) of rangeland, including approximately 1,450,000 acres of potential breeding habitat in 53 counties across the species range in Texas (USFWS 2007a). For the black-capped vireo the Service has consulted on 13 separate projects (including the Williamson County RHCP), and through section 7(a)(2), approved the removal of approximately 7,567 acres of occupied or potentially occupied habitat (USFWS 2007b). The impact of past unauthorized take is unknown.

The existing approved impacts to 7,567 acres of potential black-capped vireo habitat plus the impacts to an estimated 1,000 acres of potential habitat for which this RHCP seeks approval totals 8,567 acres, or 0.6 percent of black-capped vireo habitat in Texas (Table 4-9).

Future actions that are likely to affect black-capped vireo breeding habitat are impossible to predict with any precision. However, Hays County, immediately north of Comal County, has developed an RHCP that will impact vireo habitat. The expected impacts to black-capped vireo habitat in Hays County is 1,300 acres [526 hectares] or 0.09 percent of the estimated available habitat (1,300/1,450,000 x 100). Combined with the Comal County RHCP, these two plans will impact 0.16 percent of the remaining available habitat throughout the species' range. Bexar County, immediately south of Comal County, is also initiating an RHCP planning process that is likely to include the black-capped vireo (the Southern Edwards Plateau RHCP); however, no take estimates are available at this time.

The critical difference between No Action and the RHCP is that each acre of black-capped vireo habitat impacted under the RHCP will be mitigated by the preservation in perpetuity of at least an acre of potential black-capped vireo habitat. The more black-capped vireo habitat that is protected from development over the long term, the greater the likelihood that the species will be conserved. Compared to what would likely occur without the RHCP, the permanent preservation of habitat under the RHCP, combined with a greater awareness in the County of ESA compliance options and the need for species conservation, would result in less adverse cumulative impact to the black-capped vireo.

While future take of this species in the United States is unknown, it is important to note that a recent status review of the black-capped vireo (USFWS 2007a) found that the population size and distribution of the species is significantly greater today than was thought at the time of the listing. As a result, the Service has recommended that the black-capped vireo be downlisted from endangered to threatened. Even with continued growth in the human population within the range of the black-capped vireo over the life of the RHCP, the focus on management of the

black-capped vireo brought by the original listing, and the long-term habitat preservation that will occur as a requirement of existing HCPs and this RHCP, may assure the long-term viability of the black-capped vireo.

CHAPTER 4 – MINIMIZATION AND MITIGATION MEASURES

The following sections list the goals and objectives of this RHCP and describe the steps that will be taken to minimize and mitigate the impacts of incidental take of Covered Species authorized by the requested Permit. These steps may also benefit the Evaluation Species.

4.1 GOALS AND OBJECTIVES OF THE COMAL COUNTY RHCP

The RHCP and proposed Permit are designed to achieve the following goals:

- Conserve natural resources: contribute to and facilitate the long-term conservation of the Covered and Evaluation Species in Comal County.
- Maintain open space and quality of life in Comal County: help to ensure that some of the natural character of the County is maintained despite extensive anticipated development.
- Reduce burden on individual ESA permit applicants: reduce time and logistical burdens for individual project proponents seeking authorization for incidental take of listed species.
- Promote responsible economic activities: facilitate the coordinated and beneficial use of land within Comal County to promote the local economy.
- Provide efficient and effective administration of the ESA: reduce the administrative and logistical burden on the Service of processing individual ESA permits and monitoring post-issuance performance of multiple individual permit projects within the County.

The RHCP is designed to meet these goals through a variety of mechanisms and programs, the core features of which include:

- Meeting the biological goals and objectives described below and applying the associated conservation measures.
- Describing the conditions necessary for Comal County to secure Service authorization for take of Covered Species during land use and development projects.
- Establishing the standards and procedures for extending the RHCP permit take authorization to covered activities within the County.
- Establishing a system of permanent preserves of golden-cheeked warbler habitat or purchasing golden-cheeked warbler credits from other Service-approved conservation banks whose service areas include Comal County.
- Providing for the conservation of the black-capped vireo either directly through establishing perpetual preserves or indirectly through the purchase or utilization of Service-approved conservation credits.

4.1.1 Biological Goals and Objectives of the RHCP

The HCP Handbook 2000 Addendum defines biological goals as the broad, guiding principles that clarify the purpose and direction of the conservation components of an HCP (65 FR 35241). The biological goals and objectives are designed to address the anticipated impacts of the proposed activities while taking into account the overall conservation needs of the listed species and their habitat. Conservation measures identified in an HCP, including minimization and mitigation strategies, provide the means for achieving these biological goals and objectives.

4.1.1.1 Biological Goals

The biological goals of this RHCP are to:

- Contribute to and facilitate the conservation of the federally listed endangered golden-cheeked warbler and black-capped vireo (the Covered Species).
- Help conserve the Evaluation Species. The Evaluation Species include the Cagle's map turtle, one cave-obligate decapod, two cave-obligate amphipods, a cave-obligate beetle, a cave-obligate harvestman, two cave-obligate spiders, and one snail (the nymph trumpet) (see Chapter 1, Section 1.1.1.1 for scientific names).

4.1.1.2 Biological Objectives and Conservation Measures

In general, the biological goals will be accomplished by: 1) minimizing disturbance to Covered Species and their habitat in Comal County, and 2) mitigating the impacts of take contemplated by this RHCP by preserving and managing certain known endangered and rare species habitat areas. In addition to these general objectives, the biological goals of the Comal County RHCP will be met by accomplishing the following objectives and conservation measures:

- Minimize disturbance during the nesting season through temporal and spatial restrictions on clearing activities.
- For the golden-cheeked warbler, establish a system of permanent preserves within the County that will serve as mitigation for impacts covered by the RHCP or purchase sufficient mitigation credits from Service-approved conservation banks, the service area of which includes Comal County. The amount of preserve land or mitigation credits needed to mitigate for the requested take is estimated to total 6,548 acres (2,650 hectares) by the end of the 30-year Permit period (see Section 4.3.1.3 for an explanation of the mitigation acreage). The actual preserve acreage will be a function of several unknown factors, including the amount of take eventually authorized through the RHCP (it may be less than the amount requested, depending on participation), the mitigation ratios to be determined on a project-by-project basis, and future opportunities for land acquisition.
- For the black-capped vireo, the County will provide mitigation for any impacts it authorizes in one of the following ways:
  - Acquisition of credits from a Service-approved conservation bank for the black-capped vireo, the service area of which includes Comal County, or, in the event the service area does not include Comal County, if the Service has specifically approved the sale of credits to Comal County.

  - Acquisition (in fee title or conservation easement) and operation, management, and monitoring in perpetuity of habitat for the black-capped vireo, including as a component of a preserve also providing habitat for the golden-cheeked warbler.
  - Acknowledgment of black-capped vireo conservation bank credits owned by a potential participant, used for the purposes of providing mitigation in exchange for participation in the RHCP, and managed in perpetuity for the benefit of the black-capped vireo.
  - In all events, no impacts to the black-capped vireo will be authorized through the RHCP unless and until sufficient black-capped vireo conservation credits have been obtained in one or more of the foregoing manners.
- For both Covered Species, manage and monitor in perpetuity all preserved habitat areas in an effort to maintain or enhance habitat quality.
- Provide annual funding of at least $10,000[19] beginning in Year 3, totaling $429,309 over the life of the RHCP, for a program of prioritized research on listed and rare species in the County.
- Provide annual funding of at least $5,000[20] beginning in Year 3,[21] totaling $214,655 over the life of the RHCP, for a public education/outreach conservation program. This program will be designed to increase public understanding and appreciation of the need to protect the Covered and Evaluation Species and minimize impacts to their habitat.
- Develop and maintain a database on the Covered and Evaluation Species locations and general population numbers within the County and preserve habitat quality indices collected during monitoring efforts. To the fullest extent allowed by State law, the County will attempt to maintain the confidentiality of the database, but allow access as approved by the Service.
- Periodically evaluate the degree to which the RHCP, as it is being implemented, is providing conservation benefits to the Evaluation Species, and, if data indicate that a species is in need of increased management or its status indicates a potentially threatened or endangered existence, identify what additional measures, if any, the County could implement through the RHCP to provide conservation benefits for the species.

4.2 RHCP PROGRAM ADMINISTRATION

Many elements of the RHCP will require consistent administrative procedures and assurances that the program will be sufficiently funded and staffed to implement all aspects of the commitments detailed in this document. Program implementation includes not just a 30-year commitment over the life of the Permit, but a commitment to manage the Covered Species preserves in perpetuity.

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[19] Research and public awareness expenditures are calculated to increase annually at a rate of 3.0 percent.

[20] See preceding footnote.

[21] The funding plan provides funding for public education/outreach conservation program beginning in Year 3, after the RHCP is expected to generate income sufficient for that purpose.

Management of the RHCP will be the responsibility of the County, with advice and oversight by the Service. The County will be responsible for the implementation of the mitigation measures identified in this RHCP.

Comal County will perform the following tasks:

- Establish procedures and staffing structure needed to administer the required programs.
- Administer the RHCP budget and finances, including the development of an annual operating plan.
- Enter into formal agreements (Participation Agreements and Certificates of Inclusion; see Chapter 5, Section 5.2) with the RHCP participants to ensure compliance with RHCP permit conditions.
- Identify and acquire lands for new preserves in the County in accordance with applicable State law.
- Identify and acquire lands to enhance existing conservation areas for inclusion in the conservation system as preserves for the County.
- Prepare management and monitoring plans, approved by the Service, for Covered Species preserves when and if they are established in Comal County.
- Manage and monitor preserves in perpetuity.
- Manage the mitigation program for the black-capped vireo, including the acquisition and resale of conservation credits to participants as credits become available and are needed.
- Maintain an adaptive management program and implement new management actions or abandon out-of-date procedures when appropriate.
- Report to the Service annually on the status of acquisition and management of preserve lands and development approvals and participant involvement.
- Administer a research program, including the creation and maintenance of a computerized database to manage information gathered through the research and monitoring programs.
- Design and administer a public education/outreach program.

As an advisor to and overseer of Comal County's Permit, and as the agency responsible for monitoring compliance with the conditions of the Permit, the Service will:

- Advise, in a timely fashion, the County on preserves as to their suitability for inclusion in the County's preserve system and the assignment of mitigation credits when applicable.
- Provide timely information on listings, delistings, and other conservation and recovery activities that could influence the management of the RHCP.

To accomplish the RHCP goals it is anticipated that the County may hire an RHCP administrator and appropriate staff. It is currently anticipated that the County will outsource science-related services needed for RHCP administration on an as-needed basis. The County may choose to

subcontract much of the initial RHCP monitoring and database management, but ultimately the County may be sufficiently staffed to handle these functions in-house.

4.3 GOLDEN-CHEEKED WARBLER (COVERED SPECIES)

4.3.1 Conservation Plan Components

The impacts on the golden-cheeked warbler will be minimized and mitigated by meeting the goals and objectives of this RHCP. The strategy for meeting these goals and objectives includes identifying and minimizing impacts to potential golden-cheeked warbler habitat; minimizing disturbance during the nesting season; and mitigating impacts to golden-cheeked warblers and their habitat through a system of preserves.

4.3.1.1 Identifying and Minimizing Impact to Warbler Habitat

Figures 2-3 and 2-4 provide a preliminary assessment of where in the County potentially occupied habitat is most likely to be found; however, a final determination of suitability of habitat must be made on-site. The specific vegetative community parameters characterizing potential golden-cheeked warbler nesting habitat and the details on how the habitat maps were prepared are provided in Chapter 2, Section 2.2.1.4 of this RHCP. Once the RHCP is implemented, the RHCP administrator will maintain the digital orthoquads from which the vegetation/habitat maps were made (these may also be available for sale through the RHCP administrator) and will be able to overlay property boundary delineations on the aerial photographs and orthoquads to determine the portion of a property that contains the woodlands typically utilized by the golden-cheeked warblers. RHCP participants may use this information as a first level of habitat review during their due diligence and follow this with habitat assessments or presence/absence surveys for a final determination of potential or occupied habitat potentially affected by proposed development. While golden-cheeked warblers are more likely to occupy habitat with greater than 50 percent woodlands composition as shown in Figures 2-3 and 2-4, warblers are also found in less dense woodlands; to be conservative, and to follow TPWD (2006) standards, RHCP participants will be advised to conduct habitat assessments on all vegetation with woodlands composition greater than 30 percent composition. Participants will also be provided with TPWD (2006) information on what constitutes potential warbler habitat. Habitat assessments would be performed by a Service-permitted biologist according to TPWD (2006) standards, and presence/absence warbler surveys would be performed according to Service protocols.

Minimization of impact to golden-cheeked warbler habitat will also be encouraged through a public education/outreach program managed by the County.

4.3.1.2 Minimizing Disturbance during the Nesting Season

Clearing activities in, or within 300 feet of, golden-cheeked warbler habitat, as determined by the landowner and the RHCP administrator from on-site assessments, will be conducted only during the time of year when the golden-cheeked warbler is not present (August 1 through February 29), unless a breeding season survey performed according to Service protocols by an ESA section

10(a)(1)(A)-permitted biologist indicates that no golden-cheeked warblers are present within 300 feet of the desired activity. Construction activities within 300 feet of golden-cheeked warbler habitat may be conducted during the time of year when golden-cheeked warblers are present, as long as such construction follows permitted clearing in a reasonably prompt and expeditious manner indicating a continuous activity.

4.3.1.3 Mitigating Impacts to the Golden-cheeked Warbler

To mitigate for take of the golden-cheeked warbler occurring under the Permit, the RHCP proposes to establish permanent preserves of suitable habitat within the County. Each preserve established by the County for the purpose of generating credits must be approved by the Service. The County may also purchase credits from a Service-approved bank, the service area of which includes Comal County, or work with willing landowners or other entities in the creation of preserves.

Once a preserve/conservation bank is established, the County will sell credits from the bank to RHCP participants. To determine the amount of take and number of credits needed for a particular project, the RHCP administrator will review the participant's land use plans, habitat assessments, and/or presence/absence surveys and evaluate the amount of impact and mitigation requirements (acres of golden-cheeked warbler habitat preserved) for the project. If the RHCP participant chooses not to conduct a presence/absence survey, presence of the species will be assumed and the level of take and mitigation will be based on the amount and quality of potential golden-cheeked warbler habitat affected by development activities.

This RHCP proposes a base mitigation ratio (acres of habitat preserved to acres impacted) of 1 acre preserved for every 1 acre of impact to golden-cheeked warbler occupied or potential habitat within Comal County. It is recognized that most individual section 10(a) transactions between a landowner and the Service result in mitigation ratios that are higher than 1:1, often resulting in a 2:1 or 3:1 mitigation ratio, depending upon the quality of the habitat impacted and its proximity to adjacent occupied habitat. Mitigation ratios for Regional HCPs, however, are often lower than those for individual HCPs due to the large preserve systems anticipated through implementation of the RHCPs and committed to by the permittees. For most participant transactions that will be covered under this RHCP, the habitat impacted is anticipated to be in relatively small patches (10 to 250 acres [4 to 101 hectares] in size). In contrast, RHCP preserve habitat will be in larger patches (500-acre [202-hectare] minimum) and will be protected and managed for golden-cheeked warblers in perpetuity.

It is recognized that in some instances impacted habitat will be of a higher quality than the average in Comal County and in these cases a higher mitigation ratio than 1:1 may be justified. In such cases, the County will, based on quantification of habitat values, either: 1) deny participation of a land development project if impacts would preclude realization of biological goals and objectives, or 2) increase the mitigation ratio. Habitat quality will be evaluated by a Service-approved biologist using TPWD (2006) guidelines, and the appropriate mitigation ratio will be determined by RHCP staff and approved by the Service based on the habitat evaluation.

The mitigation ratio will be determined on the basis of habitat quality; that is, on patch size, proximity of impacted woodland to either an existing preserve or a potential preserve, and overall vegetative characteristics. In general, the more mature the junipers (cedars), and the higher the ratio of hardwoods to junipers, and the more mature the forest (large trees and degree of canopy closure), the higher the quality of habitat. In all cases the mitigation ratio will take into account the amount of impact expected to occur as measured by the number of pairs of golden-cheeked warblers potentially harmed by the action.

When an RHCP participant's property is found to contain high-quality habitat and is adjacent to high-quality habitat, and/or is known to support an unusually high density of golden-cheeked warblers (e.g., 17–20 acres [6.9–8.1 hectares] per pair), the mitigation ratio may be adjusted from 1:1 to as much as 3:1. Specifically, high-quality habitat that may require an increased mitigation ratio may be defined as any portion of a block of mature woodland 250 acres or greater in size, or contiguous to a block of woodland 250 acres or greater in size,[22] that supports an overstory canopy of Ashe juniper and mixed hardwoods with average tree heights in excess of 20 feet and with greater than 70–100 percent canopy closure. The highest mitigation ratio would occur when the woodland proposed for impact would be of the highest quality for golden-cheeked warblers *and* be within or adjacent to an existing RHCP preserve, or within a large and undisturbed patch of habitat that is also occupied by high densities of golden-cheeked warblers. Comal County will work collaboratively with the Service to ensure take and mitigation assessments are being performed in accordance with the methodology set forth in this RHCP. To that end, for the first three years after the Service's approval of this RHCP and issuance of an incidental take permit to Comal County, the County will provide to the Service the County's proposed take and mitigation assessment for each participation application. If the County has received no written objection from the Service within 15 working days, the County may assume that the Service has no objection to the take and mitigation assessment.

In this RHCP it is estimated that 80 percent of projects will mitigate at 1:1; 15 percent will mitigate at 2:1; and 5 percent of projects will mitigate at the highest level, 3:1. As stated above, underlying the 1:1 ratio for 80 percent of participant projects is the premise that the quality of habitat in preserves will be equal to or better than most of the habitat impacted (inferior habitat will not be accepted for preserves by either the County or the Service), and preserves will be large blocks of habitat protected in perpetuity. In contrast, acres impacted by RHCP participants are expected to be in smaller parcels and obviously unprotected. Given the greater value of large blocks of permanently protected habitat compared to the impacted acres, a 1:1 mitigation ratio is reasonable. For the purposes of planning, and in the absence of precise data, "most" of the habitat impacted is subjectively but reasonably assumed to be 80 percent of the habitat impacted: hence, the estimate that 80 percent of impacted habitat will be mitigated at 1:1. The remaining 20 percent of impacted acres comprises those of exceptional value; for example, parcels adjacent to an existing or potential preserve. Their loss to any future expansion of the preserve justifies a higher mitigation ratio. The RHCP could have estimated a mitigation ratio of 2:1 for the entire 20 percent, but it was thought prudent to provide for highly exceptional cases; for example, a

[22] Scientists have determined that patches of suitable golden-cheeked warbler habitat that are <250 acres in size are less likely to have high densities of occupancy than patches ≥250 acres in size (see Coldren 1998, Wahl et al. 1990).

parcel of high quality habitat largely surrounded by protected habitat. Thus, it was estimated that a small percentage of impacted acres, 5 percent, will eventually be mitigated at 3:1.

The combined mitigation ratio for roughly 5,238 acres of take results in a combined preserve size of 6,548 acres at 50 percent participation. Over the 30-year life of the RHCP, an average of 218 acres (88 hectares) of mitigation credits will be needed each year. In reality, however, development and RHCP participation will likely vary in intensity from year to year, and demand for mitigation credits will vary as well. For planning purposes, it is anticipated that during the first five years of the RHCP, the participation rate will likely be lower than in subsequent years.

Golden-cheeked warbler habitat preserves may be single tracts of land or may contain multiple contiguous or proximate tracts. The RHCP recognizes that individual tracts of suitable habitat larger than 250 acres in size, let alone 500 acres, are becoming increasingly rare in Comal County, and most preserve acquisitions will require multiple land transactions and involve more than a single willing landowner.

The minimum preserve size will be 500 acres depending on several biological factors related to habitat quality and potential edge effects. While RHCP administrators will ensure that the preserve blocks will be 500 acres or more in size, establishment of preserves smaller than 500 acres will be considered on a case-by-case basis and must be approved by the Service. For example, smaller preserves will be considered and may be approved by the Service where suitable undeveloped habitat blocks of less than 500 acres occur where suitable golden-cheeked warbler habitat adjacent to the potential preserve will be preserved because of existing conservation easements, topographic limitations, density, or other restrictions. In any event, the number of mitigation credits allowed for each preserve will be based on uniformly adopted and applied Service methodologies.

Preserve establishment will be through either fee simple purchase, conservation easement, or a private/county conservation bank, or a combination thereof. At any point, when available RHCP mitigation credits are exhausted through the participation process, no additional take of golden-cheeked warbler habitat will be permitted until such time additional preserves are established and associated mitigation credits are approved by the Service.

4.4 BLACK-CAPPED VIREO (COVERED SPECIES)

4.4.1 RHCP Components

The strategy for meeting the goals and objectives for the black-capped vireo includes conserving the black-capped vireo by minimizing disturbance during the species' nesting season; purchasing mitigation credits from a Service-approved conservation bank(s), the service area of which includes Comal County; providing mitigation credits to RHCP participants for suitable black-capped vireo habitat that occurs in preserves established under the RHCP; a research program (see Section 4.7.1); and increasing public awareness through a public education/outreach program (see Section 4.7.2).

4.4.1.1 Minimizing Disturbance during the Nesting Season

On participating parcels, clearing activities within potential black-capped vireo habitat, or within 300 feet of potential black-capped vireo habitat, will be conducted only during the time of year when the black-capped vireo is not present (September 1 through March 15), unless a breeding season survey performed by an ESA section 10(a)(1)(A)-permitted biologist indicates that no black-capped vireos are present within 300 feet of the desired activity. Construction activities in, or within 300 feet of black-capped vireo habitat, may be conducted during the time of year when black-capped vireos are present as long as such construction follows permitted clearing, as referenced above, in a reasonably prompt and expeditious manner indicating a continuous activity.

4.4.1.2 Mitigating Impacts to the Black-capped Vireo

The County will provide mitigation for any impacts it authorizes to the black-capped vireo in one of the following ways:

- Acquisition of credits from a Service-approved conservation bank for the black-capped vireo, the service area of which includes Comal County, or, in the event the service area does not include Comal County, if the Service has specifically approved the sale of credits to Comal County.
- Acquisition (in fee title or conservation easement) and operation, management, and monitoring in perpetuity of habitat for the black-capped vireo, including as a component of a preserve also providing habitat for the golden-cheeked warbler.
- Acceptance of the use black-capped vireo credits acquired by a potential participant from a Service-approved conservation bank, the service area of which includes Comal County, and used for the purposes of providing mitigation in exchange for participation in the RHCP.
- On a case-by-case basis, with Service approval, acceptance of conveyance of fee title or perpetual conservation easement covering black-capped vireo habitat, and managed in perpetuity for the benefit of that species in lieu of participation fees under this RHCP.
- In all events, no impacts to the black-capped vireo will be authorized through the RHCP unless and until sufficient black-capped vireo conservation credits have been obtained in one or more of the foregoing manners.

If and when impacts to black-capped vireo may result from a proposed participant project, the RHCP administrator will review the proposed participant's land use plans, habitat assessments, and/or results of breeding bird surveys and evaluate the amount of take and participation fee requirements.

The norm will be to acquire 1 acre of black-capped vireo conservation credits or preserve 1 acre of black-capped vireo habitat for every acre of black-capped vireo habitat impacted. The base 1:1 mitigation ratio is justified for the following reasons: 1) the impacted black-capped vireo habitat is likely to be highly fragmented, while the mitigation habitat will likely be in large preserves and is expected to support more territories per unit of habitat; 2) the mitigation habitat,

once restored, will be protected and maintained over time as black-capped vireo habitat, while the impacted habitat, if not disturbed, would have become unsuitable for black-capped vireos through natural plant succession; and 3) black-capped vireos have not been recorded in Comal County. This suggests that the potential black-capped vireo habitat that does exist in the County is limited. It is recognized, however, that in rare instances impacted habitat will be of a higher quality than the Comal County norm, and in these cases a higher mitigation ratio may be justified. The RHCP reserves the right, based on quantification of habitat values,[23] to either deny participation of a land development project, or increase the mitigation ratio from 1:1 up to 2:1.

4.5 EVALUATION SPECIES

The status of these species will be monitored and assessed, and the list of Evaluation Species will be updated annually. The Evaluation Species that share habitat with the Covered Species are expected to receive collateral benefit from the mitigation measures in this RHCP designed to conserve and aid in the recovery of the Covered Species. For example, consideration would be given to selection of preserve sites where as many as possible Covered and Evaluation Species occur together. Consequently, any species other than the Covered Species, including rare species present in protected areas, would also benefit from implementation of the RHCP.

As judged appropriate by the RHCP administrator and the Service, targeted Evaluation Species will benefit from the research, data collection, and database programs described in Section 4.7.1, below, and Chapter 6, Section 6.1.3.

4.6 DETERMINING THE STATUS OF THE RHCP COVERED AND EVALUATION SPECIES

The RHCP has established a process for determining the status of the RHCP Covered and Evaluation Species (see Chapter 6, Section 6.1.3 for a detailed description of the species and habitat tracking process that will be implemented). This process will provide an evaluation on how well the RHCP is working and will identify other species that may be of concern in the future. If it is apparent that a Covered Species is improving in status, the RHCP administrator will make recommendations in the annual report on the existence of data that would be relevant to downlisting, delisting, or listing efforts. Should data indicate that one of the Evaluation Species is in need of increased management or its status indicates a potentially threatened or endangered existence, the County would evaluate the degree to which the RHCP, as it is being implemented, is providing conservation benefits to the species and what additional measures, if any, the County could implement through the RHCP to provide conservation benefits for the species. Depending on this evaluation, the County will decide whether to seek coverage of the species under the RHCP. If it is determined that coverage would benefit both Comal County and the species in question, the County would apply for any appropriate amendments to the RHCP, the Permit, and the Biological Opinion.

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[23] Habitat values will be judged by a Service-permitted biologist according to TPWD vireo habitat assessment criteria (TPWD 1987, Campbell 2003) and proximity to established conservation areas. When presence/absence surveys have been performed, numbers of pairs or singing males/unit area will be taken into consideration.

4.7 RESEARCH AND PUBLIC AWARENESS

4.7.1 Research

The RHCP will fund research on the Covered and Evaluation Species of Comal County, with primary focus on reviewing the status of the Evaluation Species. The RHCP will provide a prioritized list of research topics each year, and researchers will be invited to compete for the funding. Information resulting from RHCP-funded research and gathered in the process of managing and monitoring preserves will be assembled in a computerized database. The database will include information on species presence/absence, numbers of species encountered on each site visit, habitat quantity/quality, vitality of surface vegetative communities, and other ecological and physiochemical parameters. The County may initially choose to subcontract much of the initial database management, but ultimately it is possible that the County will be sufficiently staffed to handle this function in-house.

Funding for research activities will start at $10,000 in Year 3 of the RHCP and, with a 3.0 percent annual increase in funding, reach a total expenditure of $429,309 over 30 years.

4.7.2 Increasing Public Awareness

The RHCP will develop a public education/outreach program designed to educate Comal County residents as to the value and appropriateness of conserving the RHCP Covered Species and Evaluation Species. Emphasis will be placed on encouraging landowners to enter into agreements with the County to create preserves for the Covered Species or to create private conservation banks. Funding will start at $5,000 in Year 3[24] of the RHCP and, with a 3.0 percent increase in annual funding, reach a total expenditure of approximately $214,655 over 30 years. The products resulting from this effort will take a variety of forms including, but not limited to: 1) a brochure describing the approved RHCP; 2) PowerPoint presentations describing the approved RHCP for presentation to real estate interests and developers, landowners, community groups, local governments, and middle and high school students; and 3) a short video describing the approved RHCP.

To make individual land developers aware of the RHCP and encourage participation in the program, the County will provide potential participants with information concerning the general location of potential Covered Species habitat in the County, a description of suitable habitat according to TPWD guidelines habitat, the requirements of the ESA, the availability of the RHCP for covering any take of covered species that may be associated with development of the property, and the availability of the TCEQ Optional Measures designed to avoid harm to certain aquatic and terrestrial species.

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[24] The funding plan anticipates that the RHCP will not generate sufficient income to fund these programs until Year 3.

4.8 RHCP ENDOWMENT AND CONTINGENCY FUND

4.8.1 RHCP Endowment

The RHCP commits to managing in perpetuity all preserves established under the authority of the RHCP. To help provide the long-term costs required to ensure preserve management is accomplished, an endowment totaling $16,500,000 will be established by Year 30. Contributions to a non-wasting endowment will be in varying amounts ranging from $1,000,000 to $3,000,000 beginning in Year 22 and continuing through Year 30. Additional endowments, grants, and contributions will be solicited by the County over the 30-year permit period. In addition, County expenses may decrease through time, as the adaptive management process focuses on minimizing disturbance to the protected species and their habitat.

4.8.2 Contingency Fund

The RHCP annual operating budget will be augmented each year by at least $5,000 as a hedge against unexpected periodic RHCP amendments and any unanticipated or otherwise unforeseen costs associated with program and permit operations. The contribution to the contingency fund will be $5,000 in Year 1, increasing annually by 3.0 percent.

CHAPTER 5 – PARTICIPATION PROCESS

5.1 ELIGIBILITY STANDARDS

Any party within Comal County desiring to undertake activities covered by this RHCP within an area that contains potential habitat for golden-cheeked warblers or black-capped vireos may be eligible for participation.[25] Potential habitat areas are defined as follows:[26]

- Golden-cheeked warbler: mature juniper/hardwood woodlands determined to be potential golden-cheeked warbler habitat by a Service-permitted biologist during an on-site habitat assessment per TPWD (2006) standards.
- Black-capped vireo: early successional mixed forest-shrub land determined to be potential black-capped vireo habitat by a Service-permitted biologist during an on-site habitat assessment per TPWD (1987) standards.

Participation in the RHCP will be voluntary. Those choosing not to participate will need to either seek individual permits from the Service or develop independent strategies for compliance that may or may not adhere to the methodologies developed in this RHCP. One of the purposes of this RHCP is to offer landowners and the community an option for compliance with the ESA that requires less time and money and provides greater certainty for both landowners and species conservation than obtaining Service approval or compliance on an individual basis. While participation in the RHCP will be encouraged as a rule, the County reserves the right to decline to allow participation in the RHCP when that participation, in the judgment of the County, would not be consistent with the biological goals and objectives of the RHCP or might cause insufficient mitigation to be available for anticipated County infrastructure needs.

5.2 PARTICIPATION PROCEDURES

All entities, whether public or private, desiring to participate in the RHCP for take coverage will be subject to the participation procedures described in this section and as amended in the future. Those wishing to participate in the RHCP must submit a completed participation application[27] to the County, along with an application fee,[28] and any additional materials required by Sections 5.2.1–5.2.2 below. Potential participants will be provided information concerning the general location of potential Covered Species habitat in the County, a description of suitable habitat according to TPWD guidelines, information about the requirements of the ESA, and a description of TCEQ aquifer and other water quality protection regulations (see Chapter 1, Section 1.1.1.2). Potential participants will be informed that they must demonstrate adherence to

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[25] While HCPs typically apply to projects that lack a Federal nexus, RHCP participation also will be available for projects that do have federal nexi (e.g., Clean Water Act section 404 permit application).

[26] Songbird habitat is likely to undergo successional changes over the 30-year life of the RHCP. Every five years, the woodland habitats having the potential to support golden-cheeked warblers and/or black-capped vireos will be recalculated on the basis of updated aerial photographs.

[27] The participation application form will be available on the County's Web site, and hard copies will be available at the RHCP office.

[28] The application fee may be adjusted from time to time and will take into consideration the cost of any assessments or evaluations necessary for participation.

TCEQ regulations before being granted take authorization under the RHCP. Potential participants will also be informed about the availability of the TCEQ Optional Measures designed to avoid harm to certain aquatic and terrestrial species and be encouraged to adopt those measures.

Once the required form, materials, fee, and assurance of TCEQ regulatory compliance have been submitted to the County, and the County has completed any necessary assessments and evaluations, the County will issue a "Determination Letter" that describes the amount of authorized take. In addition, the Determination Letter will state the potential participant's cost of participating in the RHCP and the period within which the Determination Letter will remain effective.

Individuals and entities who elect to participate in the RHCP will enter into a Participation Agreement with Comal County (the Permittee). By entering into the Participation Agreement, the potential participant agrees to be bound by and comply with the applicable terms of the Permit, and in return, benefits from the authorizations granted by the Permit. In each Participation Agreement, the Service shall be named as a third-party beneficiary with the right to enforce all terms of the Participation Agreement. Once the potential participant has signed the Participation Agreement, the potential participant must return it to the appropriate County personnel for the County's signature.

Once all required signatures have been obtained, the County will issue to the potential participant, now a "participant," a Certificate of Inclusion. Certificates of Inclusion will only cover take of species covered by the RHCP, and no mitigation credit for development or Certificates of Inclusion may be provided for property located outside the jurisdictional boundaries of Comal County.[29] As a condition of participating in the RHCP, each participant will be required to record its Certificate of Inclusion in the Real Property Records of Comal County and to designate the specific tracts of land to which they apply. A copy of the recorded Certificate of Inclusion must be posted at the relevant property site during any activities affecting the habitat of species addressed in the Certificate of Inclusion. For example, the Certificate of Inclusion must be posted from the time vegetation clearing begins until the construction is completed. For residential development, "completed construction" means that all roads and utilities are completed to the extent they meet all applicable legal or other requirements and have obtained all requisite approval—governmental or otherwise. For commercial, industrial, and multi-family developments, completed construction means that buildings are suitable for occupancy. It is not anticipated that Certificates of Inclusion are transferable except to subsequent owners of the property to which the Certificates of Inclusion apply.

So long as the Permit remains in effect and a participant is in compliance with its Participation Agreement, that participant shall be deemed to have, with respect to the participant's property covered by the Participation Agreement, the full benefits and authorities of the Permit associated with this RHCP. In the event that the Service may seek to suspend, terminate, or revoke the Permit for reasons not the fault of a participant, and that participant is in compliance with the

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[29] The County could, however, sell mitigation credits to persons or entities outside Comal County, so long as those persons or entities hold other ESA authorization, and so long as the Service grants approval for such a transaction.

terms of its Participation Agreement, the Service shall seek to craft a remedy that does not affect that participant's rights, benefits, and responsibilities under the Permit prior to suspending, terminating, or revoking the Permit. If it is not practicable to craft such a remedy and the Service suspends, terminates, or revokes the Permit, the Service will process for issuance to any such participant a permit conferring the same rights, benefits, and responsibilities with respect to the participant's property as provided under the Permit, without additional requirements or conditions beyond those applicable to the participant under its Participation Agreement. Additionally, the Service agrees that a breach by a participant of its obligations under a Participation Agreement will not be considered a violation by the Permittee or any other participant of this Permit. In the event a participant has materially breached its Participation Agreement and, after reasonable notice and opportunity to cure, such participant fails to cure, remedy, rectify, or adequately mitigate the effects of such breach, then the County or Service shall take the appropriate remedy, including termination of that participant's Participation Agreement.

The following sections summarizing participation procedures present separate scenarios for potential take of the covered golden-cheeked warbler and black-capped vireo. It is possible that during the development of certain properties more than one of the Covered Species could be involved.

5.2.1 Golden-cheeked Warbler

Pursuant to this RHCP, an individual or entity planning an activity that may potentially affect golden-cheeked warbler habitat in Comal County can mitigate for take of this species. The County will establish the level of expected take after a review of the proposed development activities and the habitat assessment, or the presence/absence survey if one has been performed. If the RHCP participant chooses not to conduct a presence/absence survey, the level of take and mitigation will be based on the amount and quality of *potential* golden-cheeked warbler habitat affected by development activities. If golden-cheeked warblers are detected during the presence/absence survey, mitigation for the affected occupied habitat[30] will be required, normally at a 1:1 ratio (see Chapter 4, Section 4.3.1.3 for an explanation of exceptions). Costs for the habitat assessment will be at the participant's expense.

RHCP participants whose activities will affect potential golden-cheeked warbler habitat will pay a per-acre fee based on the amount of potential golden-cheeked warbler habitat present and directly and indirectly impacted by development. The RHCP defines direct impacts as those areas where potential or occupied habitat is actually destroyed or significantly modified. For this RHCP, mitigation for direct impacts will normally be valued on a 1 to 1 ratio, where for every acre of habitat destroyed 1 acre of mitigation will be required (again, see Section 4.3.1.3 for an explanation of exceptions). Indirect impacts are those impacts that occur in golden-cheeked warbler habitat adjacent to destroyed or modified habitat; these impacts will be assessed at 50 percent of the value of direct impacts for a distance of 300 feet from the edge of the direct

[30] Generally, all contiguous woodlands having the characteristics of potential habitat will be considered occupied if any portion of such woodlands are found to be occupied by warblers during a survey.

impacts.[31] Although participation will typically involve the payment of "participation fees," it is possible that some participants may desire to donate land occupied by Covered Species in lieu of paying the participation fees. All transactions involving land in lieu of participation fees will be negotiated on a case-by-case basis and will be supported by species habitat surveys, appraisals, and other appropriate analyses acceptable to the County and the landowner.

The County will provide the RHCP participant an assessment of the participation fee required in order for the participant to be covered by the terms of the Permit. The participation fee for take of golden-cheeked warbler habitat is $7,500/acre in the first year fees are charged and may be adjusted on an annual basis at the discretion of the County.

In the example illustrated in Figure 5-1, the participant's property contains golden-cheeked warbler habitat and abuts an established conservation area for the golden-cheeked warbler. For the purposes of this RHCP a golden-cheeked warbler conservation area is defined as a block of protected potential or occupied warbler habitat at least 500 acres in size that is under Service-approved, long-term management for the benefit of the golden-cheeked warbler. In certain cases, it is possible that the Service may accept as viable a preserved parcel of less than 250 acres. This minimum size is based on findings of Coldren (1998) (see the discussion of habitat quality and patch size in Chapter 2, Section 2.2.1.1). As shown in Figure 5-1, the participant has decided to develop a portion of the habitat on his property, avoid a portion of the habitat, and dedicate a portion of the habitat to the neighboring conservation area.

Also in this example, the participant opted not to have bird surveys done (bird surveys may result in lower participation fees, but may also significantly delay project construction). A fee was assessed for the golden-cheeked warbler habitat to be destroyed (direct impact) and for the habitat to be left intact within 300 feet of the destroyed habitat (indirect impact). No fee was assessed for the avoided habitat because no development will take place within 300 feet of that habitat. For the habitat dedicated to the conservation area, the participant received a per-acre credit equal to the per-acre participation fee.

The RHCP proposes a mitigation ratio normally of 1 acre preserved for every 1 acre of impact to occupied and/or suitable golden-cheeked warbler habitat throughout the Comal County RHCP plan area (see Chapter 4, Section 4.3.1.3 for an explanation of exceptions to the 1:1 ratio).

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[31] The methodology for assessing take and mitigation is based upon the best available scientific information and upon the amount of harm to the Covered Species.

Figure 5-1. Example of golden-cheeked warbler RHCP participation fees.

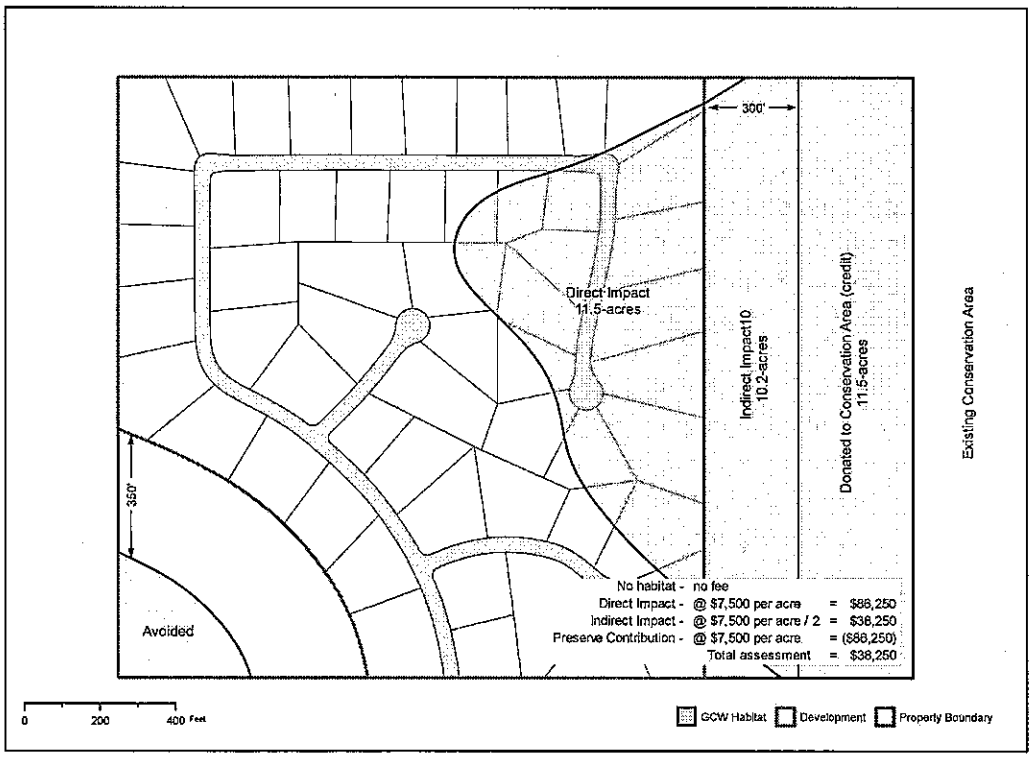

Figure 5-1. Example of golden-cheeked warbler RHCP participation fees.

5.2.2 Black-capped Vireo

Pursuant to this RHCP, an individual or entity planning an activity that may potentially disturb black-capped vireo habitat in Comal County can mitigate for take of this species. The County will establish the level of expected take on a project-by-project basis after a review of the development activities proposed and the status of the black-capped vireo habitat on the subject property.

The County biologists will review the preliminary plat or conceptual development plan, compare this with the habitat maps, and visit the site for verification of the amount of habitat expected to be impacted. Costs for this assessment will be at each participant's expense and will normally not exceed the cost for one biologist per day for each 40 acres (16 hectares) of habitat. This assessment will be done in a timely (30 days) fashion.

RHCP participants whose activities will affect black-capped vireo habitat will pay a per-acre fee based on the amount of black-capped vireo habitat potentially impacted and the cost to the County of acquiring the appropriate number of mitigation credits. In this RHCP, it is assumed that potential black-capped vireo habitat that is not subject to Service-protocol presence/absence surveys is occupied. A participant, however, has the option of having the subject property surveyed for occupancy in accordance with Service-approved protocols. If those surveys are current according to USFWS protocols and indicate that the potential habitat is not occupied, the County will not charge a fee for impacts to that habitat.

The County will provide the RHCP participant an assessment of the participation fee required in order for the participant to be covered by the terms of the Permit. The participation fee for take of black-capped vireo habitat will be determined based on the cost to the County of acquiring conservation credits (see Chapter 4, Section 4.4.1.2 for an explanation of exceptions to the 1:1 ratio).

CHAPTER 6 – ADAPTIVE MANAGEMENT, MONITORING, AND REPORTING

6.1 ADAPTIVE MANAGEMENT

Evaluating the effectiveness of mitigation will be closely tied to the adaptive management and monitoring components of the RHCP. Adaptive management is a dynamic process that helps reduce uncertainty in natural resource management by incorporating into flexible management plans new information as it becomes available. The basic foundation of the adaptive management concept is a "learn by doing" experimentation process that allows natural resource managers to learn more about the complex environmental systems they are charged to protect. Walters (1986) described an approach to the adaptive management process as beginning "with the central tenet that management involves a continual learning process that cannot conveniently be separated into functions like 'research' and 'ongoing regulatory activities', and probably never converges to a state of blissful equilibrium involving full knowledge and optimum productivity." He further characterized adaptive management as the process of:

- bounding management problems and recognizing constraints;
- representing knowledge in models of dynamic behavior that identify assumptions and predictions so experience can further learning;
- representing uncertainty and identifying alternate hypotheses; and
- designing policies to provide continued resource productivity and opportunities for learning.

According to Service policy (see 65 FR 35242), adaptive management is defined as a formal, structured approach to dealing with uncertainty in natural resources management, using the experience of management and the results of research as an ongoing feedback loop for continuous improvement. Adaptive approaches to management recognize that the answers to all management questions are not known and that the information necessary to formulate answers is often unavailable. Adaptive management also includes, by definition, a commitment to change management practices when determined appropriate.

The primary reason for using adaptive management in HCPs is to allow for changes in the mitigation strategies that may be necessary to reach the long-term goals (or biological objectives) of the HCP. Under adaptive management, the mitigation activities of the HCP can be monitored and analyzed to determine if they are producing the required results. If the desired results are not being achieved, then adjustments in the mitigation strategy can be considered.

To ensure that the adaptive management process is appropriately implemented throughout the RHCP permit period, the process needs to be formalized within the RHCP management and reporting framework. To this end the RHCP recognizes the need to establish an Adaptive Management Work Group.

6.1.1 Adaptive Management Work Group

To produce an efficient and effective adaptive management process for the RHCP, the County will establish a several-member Adaptive Management Work Group that could include the RHCP administrator and, for example, representatives from the Service, the TPWD, the Comal County government, the RHCP citizens advisory committee, the RHCP biological advisory team, and the scientific community. This group will review the annual report and recommend specific changes in management directions. Issues that the group will address include thoroughness of the annual report, implications of the monitoring efforts relating to the need for management changes, assessment of research priorities, and the effectiveness of the County at achieving RHCP goals. The Adaptive Management Work Group will meet at least twice a year, once to review the County's annual report to the Service, and once to review, approve and/or recommend modifications to the annual operating/funding plan.

6.1.2 Adaptive Management Framework

The Service developed a framework for addressing adaptive management in HCPs that includes: 1) identifying areas of uncertainty and questions that need to be addressed to resolve this uncertainty; 2) developing alternative management strategies and determining which of these strategies to implement on an experimental basis; 3) integrating a monitoring program that is able to acquire the necessary information for effective strategy evaluation; and 4) incorporating feedback loops that link implementation and monitoring to the decision-making process that result in appropriate changes in management. The actions that will be taken through implementation of the RHCP to specifically address each of these framework issues are presented below.

1. *Identifying areas of uncertainty and questions that need to be addressed to resolve this uncertainty.*

   The adaptive management process is a method to ensure that timely management responses to new data are implemented.

2. *Developing alternative management strategies and determining which experimental strategies to implement.*

   Flexibility for the development of alternative management strategies when research, experimentation, or common sense indicates changes in management are needed is a key element of the adaptive management process.

3. *Integrating a monitoring program that is able to acquire the necessary information for effective strategy evaluation.*

   A monitoring program where preserve habitats are regularly and consistently monitored is an important element to the management of preserve resources. Site-specific monitoring plans will be developed and implemented for the golden-cheeked warbler when a preserve for that

species is established. If a preserve contains potential black-capped vireo habitat, that habitat may be managed for the vireo.

4. *Incorporating feedback loops that link implementation and monitoring to the decision-making process that result in appropriate changes in management.*

   Linking monitoring and research data to changes in management is the primary responsibility of the Adaptive Management Work Group. Consistent with the No Surprises Assurances described in Chapter 8, if a determination is made by the Adaptive Management Work Group that the goals or management objectives of this RHCP are not being met, or management and/or monitoring activity is determined to be ineffective in conserving the endangered species covered in this RHCP, then adjustments to the management program may be warranted. The annual report submitted to the Service will directly address the adaptive management issue, and a statement will be made and supported by research and monitoring findings that management should or should not change. Based on research and monitoring findings, the Adaptive Management Work Group may recommend to the RHCP administrator (a member of the group) that the RHCP be changed. The appropriate County officials will then decide whether to act on this recommendation and apply for amendment(s) to the RHCP.

6.1.3 Species and Habitat Tracking Process

The RHCP has established the following species and habitat tracking process for determining the status of the RHCP Covered and Evaluation Species on RHCP preserves and other properties dedicated to the conservation of the Covered Species.

- Every five years, the County will evaluate and report to the Service the preserve status and habitat quality improvement or deterioration.[32] This effort will be the basis of an early warning system for the decline in species and or habitat, or, alternatively, will signal improvements in species status.
- Every five years the County will conduct a literature and research update on each of the Covered Species to determine whether any new scientific information is available to improve the assessment of their status, threats to their continued survival, and their conservation needs.
- Each year, the County will evaluate and report to the Service the degree to which the RHCP, as it is being implemented, is providing conservation benefits to the species and what additional measures, if any, the County could implement through the RHCP to provide additional conservation benefits for the species.
- Depending on the assessment of RHCP benefits, the County will determine the levels of expected impact and existing protected areas for the Evaluation Species and decide whether to seek coverage of the species under the RHCP, in which case it may apply for any appropriate amendments to the RHCP.

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[32] The RHCP annual report will include data on population trends (when available) for the Covered Species and provide information on habitat quality as affected by such factors as wildfires and feral animal infestation.

6.2 MONITORING AND REPORTING

Monitoring and reporting are required by the Service to ensure compliance with the terms of the Permit and to verify progress toward the RHCP's biological goals and objectives. The reported information will include an evaluation of the implementation and effectiveness of the terms of the RHCP (including financial responsibilities and management obligation), an accounting of the amount and specific location of incidental take that has been authorized under the RHCP, a general assessment of the status of the species on RHCP preserves and any other data necessary for adaptive management purposes. The County will use the results of the monitoring efforts to assess management strategies and develop more effective alternative management strategies, as necessary, through the adaptive management procedures.

6.2.1 Biological and Compliance Monitoring

When a preserve for the golden-cheeked warbler is established, a baseline evaluation of the new preserve will be completed to determine the type and extent of existing and potential threats (i.e., deer, hog, cowbird, fire ant, or other invasive species). Based on this evaluation, a management and monitoring plan will be prepared by the County to identify appropriate measures for management/control of identified threats. All management and monitoring plans will be completed by the County within one year from when the preserve land is purchased and will be updated every five years after that. All management and monitoring plans will be submitted to the Service for review and will require Service approval to be considered complete.

The preserve boundary/perimeter will be inspected and security assessed four times each year. Beginning in Year 1 (to establish baseline) and once every five years after that, territory mapping surveys and habitat monitoring using fixed sampling sites will be performed.

An annual report summarizing the results of the boundary/perimeter inspections and security assessment and the adaptive management process will be prepared and submitted to the Service on January 1 of each calendar year. The annual report will also include a summary of the participation and funding status of the RHCP. Information provided will include the number of RHCP participants, number and specific location of acres of incidental take authorized under the RHCP to date, number of acres and location of potential habitat preserved to date, annual income and expenses of the County, and any other information relevant to the implementation of the RHCP. In addition, the annual report will review existing management and highlight areas where change in management approach may be needed and where prioritized research needs are reviewed. Also, as noted above in Section 6.1.3, the annual report will include an assessment of the degree to which the RHCP, as it is being implemented, is providing conservation benefits to the Covered and Evaluation Species and what additional measures, if any, the County could implement through the RHCP to provide additional conservation benefits for the species.

In those years when biological monitoring is performed on preserves, the annual report will also include the locations of surveys, a description of any deviations from required survey protocols, personnel used, and documentation of all survey results as required in the protocols for the particular endangered species.

CHAPTER 7 – FUNDING

7.1 OVERVIEW

Comal County will hold the Permit and will provide and obtain funding to implement the conservation and mitigation measures and monitoring and research procedures, and to satisfy other permit conditions. The ESA requires that an applicant for a section 10(a)(1)(B) permit assure adequate funding will be available to implement the HCP. In addition, Texas state law requires that when applicants for RHCPs are governmental entities they must demonstrate that adequate sources of funding will exist. This chapter contains a funding plan for the RHCP.

The estimates for loss of habitat upon which many of the funding plan elements are based are themselves based on the overall 30-year timeframe. Estimates of potential habitat loss for any one year may or may not be met or exceeded in that year once the RHCP is underway. The estimates used for financial planning purposes are not intended to function as annual authorization limits, the exceedance of which would trigger re-initiation of consultation. Allowable "take" is framed in the context of the entire life of the RHCP rather than in any plan year. It is important to emphasize that all funding projections provided in this section or those that will eventually be authorized under the RHCP are merely estimates intended to demonstrate that the plan is financially feasible. The funding plan is not substantially prescriptive of the timing, size, or nature of actions that may be taken or authorized under the RHCP and is not a recommendation of the consultants. While specific elements of the overall financing plan may change over the 30-year plan period, the permitted take and the mitigation to compensate for the effects of the incidental take will not change.

Under the RHCP, no impacts to golden-cheeked warblers will be authorized unless mitigation credits already exist, as created through the acquisition of RHCP preserves. In other words, by virtue of the RHCP's structure, funding and actual acquisition of preserves will precede any impacts to Covered Species mitigated by those preserves. No impacts to black-capped vireo will be authorized until mitigation credits from a Service-approved conservation bank have been purchased, or mitigation credits are available for vireo habitat present within an RHCP preserve. Therefore, by definition, no authorized impact to either species can go unmitigated, even if future funding does not materialize. As a result, the burden to demonstrate the availability of specific funding is lessened. Every year during the 30-year life of the RHCP the County will re-evaluate the funding plan to assure adequate funding and appropriate disposition of excess revenues to meet RHCP goals.

The RHCP may require the direct contribution of financial resources from the County. Funding for this RHCP may come from income generated by the RHCP, including the sale of mitigation credits; direct contributions by the County; and endowment investment income. Both sources of funding are assumed in the funding plan. Although not included in the funding plan, other potential sources of income include, but are not limited to, parks and open space bonds, Tax Anticipation Notes, Federal grants and appropriations, and private donations.

This funding plan is based on the premise that 50 percent of future development of potential golden-cheeked warbler habitat in Comal County will be authorized through the RHCP.

Chapter 3 (Section 3.2.2) provides an explanation of the total amount of potential habitat estimated to be developed in Comal County over the next 30 years (10,476 acres). Chapter 4 (Section 4.3.1.3) provides an explanation of how, with varying mitigation ratios, the assumed 20 to 50 percent of habitat loss to be covered by the RHCP (5,238 acres) could result in establishment of up to an estimated 6,548 acres of preserves.

7.1.1 Approaches for Establishing Golden-cheeked Warbler Preserves

Typical RHCP preserves will contain a minimum of 500 acres of golden-cheeked warbler habitat; however, acquisition of preserve land may be in smaller parcels if the subject land is contiguous to an existing conservation area (e.g., the Morton Preserve) that has been established for the benefit of the golden-cheeked warbler, or if the Service approves establishment of smaller preserves on a case-by-case basis.[33] Preserves that would generate conservation credits for the RHCP may be established in three ways: 1) fee simple purchase of habitat; 2) public/private cooperation (e.g., conservation easements); and 3) private conservation banks.

1. Under the fee simple purchase approach, Comal County would purchase and acquire full title to preserve, monitor, and manage property.

2. One method (although others are possible) for public/private cooperation envisions the County entering into conservation easement agreements with landowners that involve sharing revenues as conservation credits are sold. The County might initiate this approach by issuing a Request for Proposals for major property owners within Comal County to join the County in a cooperative program of preserve development. Assumptions made in the public/private cooperation approach may be as follows:
   - The County would pay all costs for preserve establishment, as well as assume the responsibility for long-term management and monitoring.
   - There would be multi-year repayment for conservation easements and/or fee simple purchase as a function of mitigation sales credits.
   - The County may pay some amount of negotiated conservation easement costs or purchase costs up front.
   - Any retention of mitigation credits by a conservation easement donor for that donor's use must be specified in the Conservation Bank Agreement between the donor, the County, and the Service.

3. A privately owned conservation bank would differ from a public/private conservation easement bank in that the County would not acquire a conservation easement for the subject property, nor would the County assume any responsibility for management of the preserve. Instead the landowner would independently establish a conservation bank in an agreement with the Service. The County, through the RHCP, would then facilitate participation agreements, purchase mitigation credits from the bank, then re-sell them to

[33] The County may accept donations of suitable habitat in parcels less than 500 acres in size, but eligibility for mitigation credits under the RHCP will be evaluated by the Service on a case-by-case basis.

RHCP participants. The owner of the private conservation bank would receive the majority of the revenue stream from the sale of mitigation credits.

7.2 ESTIMATION OF RHCP COSTS

Table 7-1 provides a summary of the total estimated costs,[34] or funding needs, in five-year increments, for Years 1–30 of the RHCP. An explanation of the origins and assumptions made for the cost estimates are summarized below.

7.2.1 RHCP Administration

Depending upon participation and funding levels, the County is expected to assign a half-time administrator for the RHCP in Year 1 of RHCP implementation. Other RHCP administrative and management costs will include vehicles, rent, preparation of preserve management and monitoring plans, review of applications for participation, and other direct and indirect costs. The annual costs for RHCP administration are expected to be $62,500 in Year 1, increasing by approximately 3.0 percent per year, reaching $147,285 in Year 30. Total cumulative cost for RHCP administration over the 30-year life of the RHCP is estimated at $2,973,463.

7.2.2 Golden-cheeked Warbler

As stated previously, incidental take associated with the loss of 5,238 acres of potential habitat over the 30-year Permit period will, after adjusting for varying mitigation ratios,[35] be mitigated with the acquisition of 6,548 acres of potential golden-cheeked warbler habitat for preserves.

The County would purchase 900 (364 hectares) to 1,150 acres (465 hectares) per five-year period with approximately 45.4 percent of the land purchased as fee simple, and the remaining 54.6 percent purchased as conservation easements. Initial costs for preserve lands are expected to be $15,000/acre[36] for fee simple purchases and $6,000 per acre for conservation easements, with costs increasing by 3.0 percent per year. By Year 30, the last year of land acquisition, per acre costs are calculated at $35,348 for fee simple purchases and $14,139 for conservation easements. Total cumulative cost for preserve acquisition over the 30-year life of the RHCP is estimated at $107,083,312. These estimates include transaction costs.

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[34] **COSTS DISCLAIMER.** All estimated costs/income presented in this document are provided only as a general indicator of potential levels and origins of short- and long-term RHCP expenses and income. It should also be noted that all participation fees identified in the RHCP are subject to reassessment and adjustments over the life of the RHCP.

[35] At a 1:1 mitigation ratio, the number of acres of preserve establishment required for mitigating 50 percent of 10,476 acres of impact would be 5,238. However, there will be a certain number of participant projects for which a 1:1 mitigation ratio will not be adequate. In this RHCP it is estimated that 80 percent of participating projects will mitigate at 1:1; 15 percent will mitigate at 2:1; and, 5 percent will mitigate at the highest level, 3:1. The combined mitigation ratio for roughly 5,238 acres of impact results in a preserve size of 6,548 acres at 50 percent participation.

[36] Per-acre cost estimates provided by Prime Strategies, Texas Perspectives, and Capitol Market Research.

Table 7-1. Summary of RHCP cumulative costs and income for each five-year period in the RHCP and the 30-year total.

	Years 1–5	Years 6–10	Years 11–15	Years 16–20	Years 21–25	Years 26–30	TOTAL
Costs							
RHCP Administration[1]	$331,821	$384,671	$445,940	$516,966	$599,306	$694,759	$2,973,463
Warbler Preserve Acquisition[2]	$7,254,973	$14,863,706	$17,231,108	$19,975,577	$22,150,336	$25,607,613	$107,083,312
Warbler OM&M[3]	$183,016	$437,650	$753,515	$1,158,896	$1,655,906	$2,285,869	$6,474,852
Research	$30,909	$58,014	$67,255	$77,966	$90,384	$104,780	$429,309
Public Awareness	$15,455	$29,007	$33,627	$38,983	$45,192	$52,390	$214,655
Endowment Contributions[4]	$0	$0	$0	$0	$4,500,000	$12,000,000	$16,500,000
Contingency[5]	$26,546	$30,774	$35,675	$41,357	$47,944	$55,581	$237,877
TOTAL COSTS	$7,842,719	$15,803,822	$18,567,120	$21,809,746	$29,089,068	$40,800,992	$133,913,468
Income							
Warbler Mitigation Fees[6]	$3,420,335	$5,458,092	$8,709,896	$13,899,050	$22,179,782	$34,563,292	$88,230,447
Comal County Investment Return	$0	$0	$0	0	$577,500	$2,997,500	$3,575,000
Direct County Contributions	$5,596,895	$10,345,731	$9,857,225	$7,910,697	$6,331,786	$3,240,201	$43,282,535
TOTAL INCOME	$9,017,230	$15,803,823	$18,567,121	$21,809,747	$29,089,068	$40,800,993	$135,087,982
BALANCE	**$1,174,511[7]**	**$1**	**$1**	**$1**	**$0**	**$1**	**$1,174,514**

[1] Based on Comal County using 1/2 FTE to administer the RHCP. County/Service-approved biological technical expertise will be paid for by the participant. Costs include reporting responsibilities described in Chapter 6, Section 6-2.

[2] Based on $15,000 per acre fee simple and $6,000 per acre conservation easement in Year 1, increasing by 3%/year. Mitigation of 5,238 developed acres at 80% 1 to 1 mitigation ratio (4,191 acres [1,696 hectares]); 15% 2 to 1 mitigation ratio (1,571 acres [636 hectares]); 5% 3 to 1 mitigation ratio (786 acres; 318 hectares) for a total 6,548 acres.

[3] OM & M (operations, maintenance, and monitoring) costs beyond Year 30 will be funded by interest generated by the Comal County RHCP endowment.

[4] To ensure the RHCP will operate in perpetuity, beginning in Year 22 varying amounts ranging from $1,000,000 to $3,000,000 will be dedicated each year to the endowment to cover operations after 30 years. Interest from this fund is considered as income.

[5] This fund will be used to pay for any unanticipated or otherwise unforeseen costs associated with RHCP maintenance.

[6] Based on a $7,500/acre participation fee and on 5,238 acres of golden-cheeked warbler habitat developed through participation in the RHCP, with 80% 1 to 1 mitigation ratio (4,191 acres); 15% 2 to 1 mitigation ratio (1,571 acres); 5% 3 to 1 mitigation ratio (786 acres) for a total 6,548 acres.

[7] The positive balance in Year 1–5 reflects surpluses in Years 2 an 4, when no preserve land is acquired but golden-cheeked warbler mitigation credits generated by earlier acquisitions are sold. In all other years the annual balance is zero.

In addition to acquisition costs, the County, as Permittee, is required to demonstrate adequate funding for the establishment, operation, maintenance, and monitoring of the preserves in accordance with the RHCP. Based on existing cost information for preserve establishment, monitoring and management from Williamson County (J. Rogers, Williamson County Parks and Recreation Department, pers. comm. to SWCA, 2007), the RHCP anticipates that costs will include an initial preserve establishment expense of $100/acre, and annual management costs of $30/acre. These operating and maintenance costs for preserve management are expected to be $39,000 in the first year of RHCP implementation and increase each year as the number of acres of preserves increases. By the end of the 30-year period, the management of 6,548 acres will be in excess of $500,000 per year. Total cumulative cost for preserve management over the 30-year life of the RHCP is estimated at $6,474,852. It is understood that many of the management requirements (e.g., fences and gates) will eventually need to be replaced beyond the timeframe (30 years) of the RHCP. All future costs for these replacements will be adequately funded by income generated by the endowment (see Section 7.2.6).

7.2.3 Black-capped Vireo

To the extent the County elects to acquire or create black-capped vireo credits, it will be required to obtain and utilize funding outside of the current funding plan, and then will be reimbursed through the subsequent credits thus created. Any costs and income associated with the black-capped vireo, therefore, are expected to balance in short timeframes (i.e., a money-in/money-out scenario). Funding is thus assured. As a result, actions related to black-capped vireo are not included in the RHCP budget. The County will not authorize take unless and until credits have been secured, including appropriate funding.

7.2.4 Research

An RHCP research fund will be established to support scientific studies on both the Covered and Evaluation Species. The RHCP will provide a prioritized list of research topics each year, and researchers will be invited to compete for the funding. Annual contributions to the fund will begin in Year 3 at $10,000 and will increase by 3.0 percent annually, reaching $22,213 in Year 30. Total cumulative cost for the research program over the 30-year life of the RHCP is estimated at $429,309.

7.2.5 Public Education/Outreach

The goal of the public education/outreach effort is to raise awareness of the importance of species conservation and sustainable use of the region's natural resources by a variety of means (e.g., brochure, video, computer presentations, etc.). The County will provide the public with information on how to minimize potential harm to federally listed and rare species in the County and how to become directly involved in species conservation. The RHCP will annually fund the public education/outreach program beginning with approximately $5,000 in Year 3, increasing by 3.0 percent per year over the 30 years of the RHCP until the annual cost reaches $11,106 in Year 30. Total cumulative cost for the public awareness program over the 30-year life of the RHCP is estimated at $214,655.

7.2.6 Endowment

To ensure that the conservation measures described in the RHCP related to preserve management will continue in perpetuity, a non-wasting endowment will be funded with contributions of varying amounts ranging from $1,000,000 to $3,000,000 beginning in Year 22 and continuing through Year 30, for a total contribution of $16,500,000. Income from the endowment will be used after Year 30 to partially cover costs of operating, maintaining, and monitoring preserves established under the RHCP.

7.2.7 Contingency Fund

Unexpected costs for RHCP operation may occur. In anticipation of unexpected costs, an annual contingency fund of $5,000/year will be established beginning in Year 1 of the RHCP. Contingency fund contributions will rise by an average of 3.0 percent per year until the annual cost reaches $11,783 in Year 30. Total cumulative cost for the contingency fund over the 30-year life of the RHCP is estimated at $237,877.

7.2.8 Summary of Estimated Costs

Table 7-1 shows RHCP costs for six, five-year periods. The costs in Years 1–5 are anticipated to total $7,842,719, and the costs in Years 6–10, 11–15, 16–20, 21–25, and 26–30 are anticipated to total $15,803,822, $18,567,120, $21,809,746, $29,089,068, $40,800,992, respectively. The total cumulative cost of the RHCP for the 30-year period is $133,913,468.

7.3 ESTIMATION OF RHCP INCOME

This section describes expected funding sources, including the income from RHCP participation fees, return on endowment investments, and direct County contributions. Table 7-1 shows the estimated gross income during each five-year period over the life of the RHCP, as well as the total cumulative gross income at the end of 30 years.

7.3.1 Golden-cheeked Warbler Participation Fees

The calculated income from golden-cheeked warbler participation fees is based on the assumption that, over the life of the RHCP, a total of approximately 6,548 acres of conservation credits will be sold to RHCP participants (see Section 7.2.2) at a rate of $7,500 per acre in Year 1, increasing annually by 3.0 percent. Conservation credits will be sold only after preserve land is acquired. For planning purposes, it is assumed that 75 credits will be sold in Year 1, with the annual number of credits sold increasing each year by varying amounts, ending with 432 credits sold in Year 30. Income from the sale of golden-cheeked warbler conservation credits to RHCP participants will total $88,230,447 over the 30-year life of the RHCP.

7.3.2 Black-capped Vireo

No income is shown in Table 7-1 related to the black-capped vireo for reasons explained in Section 7.2.3, above.

7.3.3 RHCP Endowment Investment Income

Annual return on contributions to the endowment is expected to range from $55,000 in Year 22 to $907,500 in Year 30. At 5.5 percent return per year, the direct endowment contributions of $16,500,000 will generate a total of approximately $3,575,000 of investment income during the 30-year life of the RHCP.

7.3.4 Direct County Contributions

The County will seek to conserve its resources through the use of cooperative and innovative conservation transactions described in this Chapter. However, the funding plan is based on the conservative presumption that those efforts will yield no savings and that the County will be required to make direct financial contributions to the RHCP.

In the funding plan, over the 30-Year life of the RHCP, the annual direct financial contributions by the County would range from $0 to $2,883,869, with an annual average of approximately $1,440,000. To place this amount in context, between 2006 and 2007, the assessed property value in Comal County increased by $520,033,000 (Comal County 2008). This represents an increase of over a million dollars in property tax revenues, assuming a constant tax rate. In addition, as stated above, while not included in the funding plan, the County anticipates that the need for direct financial contributions will be significantly reduced through innovative and cooperative approaches to conservation transactions.

7.3.5 Summary of Estimated Income

Table 7-1 shows RHCP income for six, five-year periods. The income in Years 1–5 is anticipated to total $9,017,230, and income in Years 6–10, 11–15, 16–20, 21–25 and 26–30 is anticipated to total $15,803,823, $18,567,121, $21,809,747, $29,089,068, $40,800,993, respectively. The total cumulative income for the 30-year period is an estimated $135,087,982.

7.4 SUMMARY OF COSTS AND INCOME

The RHCP costs of $133,913,468 are projected to be lower over the 30-Year period than the projected income $135,087,982. Initial estimates of participation fees and other funding sources indicate a surplus of approximately $1,174,500, all of which is realized in the first five years of the funding plan (see Table 7-1).

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CHAPTER 8 – NO SURPRISES ASSURANCES

8.1 INTRODUCTION

An important incentive to encourage participation in the RHCP is the assurance provided by the Service's regulation known as the "no surprises" rule (63 FR 8859, codified at 50 CFR §§ 17.22, 17.32). Under the No Surprises Rule, the Service assures holders of HCPs that, so long as an approved HCP is being properly implemented, no additional land use restrictions or financial compensation will be required of the permittee with respect to the Covered Species, even if unforeseen circumstances arise after the permit is issued indicating that additional mitigation is needed.

"Unforeseen circumstances" are changes in circumstances affecting a species or geographic area covered by an HCP that could not reasonably have been anticipated by plan developers and the Service at the time of the plan's negotiation and development, and that result in a substantial and adverse change in the status of the covered species.

The No Surprises Rule recognizes that the permittee and the Service can reasonably anticipate and plan for some changes in circumstances affecting a species or geographic area covered by an HCP (e.g., the listing of new species or a natural catastrophic event in areas prone to such events). To the extent such changed circumstances are provided for in the HCP, the permittee must implement the appropriate measures in response to the changed circumstances when circumstances do, in fact, change.

This chapter describes the changed circumstances anticipated by and provided for in the RHCP and explains the Service's assurances to the County with respect to any unforeseen circumstances.

8.2 CHANGED CIRCUMSTANCES PROVIDED FOR IN THE RHCP

A long-term incidental take permit should contain a procedure by which the parties will deal with changes in circumstances affecting a species or geographic area covered by the permit that can reasonably be anticipated by the HCP developers and the Service. It is recognized by Comal County and the Service that many changes in human conditions and attitudes, development pressures, environmental conditions, and scientific understanding of ecological systems, among many other circumstances, could and will occur over the 30-year Permit period.

The changed circumstances that can reasonably be anticipated by the County and the Service that can be planned for are: 1) levels of funding anticipated to cover RHCP costs thought to be sufficient today become inadequate to meet future needs; 2) property values of preserve land needed to meet RHCP goals increase more than predicted; 3) the conservation bank(s) run out of credits; 4) sufficient suitable preserve sites are not available; 5) an Evaluation Species becomes listed; 6) public use of RHCP preserves is determined to impact species; and 7) global climate change significantly and negatively alters status of the Covered Species. The procedures this RHCP has established to provide for these anticipated changed circumstances begins with implementation of an adaptive management process that allows flexibility and the detailed

monitoring of preserves. This flexibility is reflected in the responses to changed circumstances as presented below:

1. *Levels of funding anticipated to cover RHCP costs thought to be sufficient today become inadequate to meet future needs*

   As the RHCP is implemented, the annual adaptive management review will thoroughly analyze the previous year's costs, as well as cumulative costs, and adjust expenses to meet income expectations, including increasing or decreasing participation fees and seeking alternative funding mechanisms. In the event that circumstances change with respect to anticipated costs or available revenue, the County will implement the following procedures to ensure that essential elements of the conservation program continue to function as intended:

   a) Reduce or suspend funding for non-essential aspects of the RHCP conservation program, such as outreach/education program, and use funds for the implementation of essential activities.

   b) Suspend the conservation bank and enrollment of new participants in the RHCP and focus resources on the management of existing preserves and implementation of other essential administrative commitments (such and monitoring and reporting).

   c) Negotiate alternative preserve management, monitoring, or reporting requirements with the Service to reduce the cost of RHCP implementation.

   d) Increase available funding by accessing other available funding sources.

2. *Property values of preserve land needed to meet RHCP goals increase more than predicted*

   The RHCP anticipates purchasing and acquiring less than 30 percent of the land that may be needed for mitigation required for the 30-year RHCP within the first five years of the RHCP. In the event that circumstances change with respect to anticipated increases in land prices, the County will implement the following procedures to ensure that required preserve acquisition commitments are completed and the preserves/conservation bank(s) operate as intended:

   a) The County will focus on completing preserve acquisitions in portions of the County that are more affordable.

   b) At no time will the County sell mitigation credits that are not available in existing conservation banks.

3. *The conservation bank(s) runs out of credits*

   Take of golden-cheeked warbler will not be authorized under the RHCP until mitigation credits are created by establishment of preserves.

4. *Sufficient suitable preserve sites are not available*

   The County anticipates acquiring approximately 6,548 acres of preserves located within the County by the end of Year 30 of the RHCP. The RHCP specifies that a preserve block will normally contain at least 500 acres of contiguous golden-cheeked warbler habitat to be able to generate mitigation credit for the RHCP. The Service may approve establishment of smaller preserves on a case-by-case basis as described in Chapter 4, Section 4.3.1.3. These preserve acquisition projections and minimum preserve design criteria limit the properties that are suitable for inclusion in the RHCP preserve system.

   At no time will the County provide mitigation credits that are not available in existing preserves.

   If insufficient suitable preserves are available for mitigation of impacts to the black-capped vireo, and insufficient vireo habitat is available within golden-cheeked warbler preserves, the County will rely on the acquisition of credits from a conservation bank outside of the RHCP system. In any event, no take of the black-capped vireo will be authorized through the RHCP until sufficient credits are available.

5. *An Evaluation Species becomes listed*

   In the event that one or more of the Evaluation Species addressed in this RHCP is listed pursuant to the ESA, the County will evaluate the degree to which the RHCP, as it is being implemented, is providing conservation benefits to the species and what additional measures, if any, the County could implement through the RHCP to provide conservation benefits for the species. Depending on this evaluation, the County will decide whether to seek coverage of the species under an amendment to the RHCP. If it is determined that coverage would benefit both Comal County and the species in question, the County may apply for any appropriate amendments to the RHCP, the Permit, and the Biological Opinion.

6. *Public use of RHCP preserves is determined to impact species*

   All public access to RHCP preserve parcels will be in accordance with the terms of the Permit and the provisions stated below. Preserve owners may allow public access only if allowed by the Permit, this RHCP, and the land management plan approved by the Service. Preserve owners are not obligated to allow public access, and may discontinue public access at any time and for any reason.

   Public access within RHCP preserve parcels will be classified as either "passive use" or "active use." Passive use public access, as defined below, is expected to have no or negligible adverse effects on the Covered Species or their habitats and may be allowed within areas of potential habitat for the Covered Species without requiring the use of credits from the RHCP conservation bank. Active use may result in more than negligible adverse effects to the covered species and is not allowed in areas of potential habitat

(unless such effects are mitigated with credits from the conservation bank, as described below).

Passive use is defined as human foot traffic on Service-approved trails or other defined areas outside of the breeding seasons for the Covered Species. Access during the breeding season will be controlled appropriate signage, gates, monitoring, and other means. For the purpose of these public access criteria, the breeding season of the golden-cheeked warbler is defined as March 1 through July 31, and the breeding season of the black-capped vireo is defined as March 15 through August 31. The use of wheeled vehicles or equipment, such as bicycles or skates, does not meet the definition of passive use (except as needed for preserve users with disabilities). Domestic animals also do not meet the definition of passive use (except as needed for preserve users with a physical handicap). All approved trails or other defined areas of public use will be identified in the land management plan for a preserve parcel, which will be approved by the Service.

A limited number of other public activities may be allowed within areas of potential habitat, if provided for by an approved land management plan, and will be considered to be passive uses. These activities are:

- Groups of no more than ten hikers guided by a preserve manager may be allowed within areas of potential habitat, even during the main portion of the breeding seasons of the covered species.
- Hunting game within areas of potential habitat for the covered species outside of the breeding seasons of the covered species.

All other public uses of RHCP preserve parcels will be considered active uses. Active uses may include, but are not limited to, bicycling (or use of any other wheeled device not required because of physical handicap), dog walking or horseback riding (or activities involving any other pet or domesticated animal), swimming, boating, tubing, rafting, fishing, picnicking, camping, and rock-climbing. All areas of active public use will be delineated in the land management plan for that preserve parcel, which must be approved by the Service. Active public uses of the RHCP preserve system will be restricted to areas that are more than 300 feet away from areas of potential habitat for the Covered Species that generate mitigation credit for the RHCP conservation bank. If active public uses are proposed within or within 300 feet of areas of potential warbler or vireo habitat within the preserve system, this habitat will not generate mitigation credit for the RHCP. All parcels proposed for public access will also have an approved land management plan in place prior to allowing any type of public access within that parcel.

7. *Global climate change significantly and negatively alters status of the Covered Species*

Global climate change has the potential to alter current regional distribution of biotic communities in the RHCP area through regional changes in average temperature, levels and frequency of precipitation, groundwater regimes, and fire regimes. It is possible, therefore, that climate change will cause areas containing habitat currently suitable for the Covered Species to increase or decrease in value to the continued survival of the species. It is also possible that climate change would cause areas containing habitat not

currently suitable for the Covered Species, including areas not currently within the ranges of the species, to increase or decrease in value to the continued survival of the species and that the species would adapt to use such habitat. Although all Covered Species currently have either relatively or significantly limited ranges within the United States, some areas within each of the Covered Species' ranges may be more vulnerable than others.

There is at present insufficient knowledge upon which to base a projection of the potential for the habitat preserves established or managed under this RHCP to increase or decrease in value to the relevant species over the next 30 years as a result of climate change. Nor is there sufficient knowledge at present upon which to design alternative or additional mitigation measures within the RHCP that would compensate for any adverse effects of climate change on such habitat preserves. It is expected, however, that any changes will be the same as changes experienced in other areas containing habitat that is currently similar in attributes.

Accordingly, if global climate change causes any habitat preserves directly established or managed by the permittee under this RHCP to increase or decrease significantly in relative value with regard to continued survival of one or more of the Covered Species, the permittee or its assigns will consult with the Service to determine whether any changes in operation and management of those preserves are warranted. Any changes in operation and management prompted by global climate change would be performed under the established operation and management budget, and no acquisition or management of areas outside of the habitat preserves directly established or managed by the permittee under this RHCP will be provided for or required under this RHCP as a part of any response to climate change effects on such preserves. However, these lands would continue to be conserved in perpetuity.

To the extent that knowledge about the effects of climate change on the Covered Species is gained over the course of the RHCP term through adaptive management implemented under Chapter 6 of this RHCP or through research endorsed by the Service, the permittee will seek advice from the Service about the implications of such knowledge and will take such knowledge into account in any subsequent identification, establishment, and management of habitat preserves intended thereafter to serve as mitigation in satisfaction of this RHCP.

To the extent any mitigation required for impacts to Covered Species is satisfied through purchase or transfer of mitigation credits from a Service-approved third-party conservation bank not owned or operated by the permittee, or is implemented with Service approval through a conservation entity not owned or operated by the permittee, it shall be the sole responsibility of that third-party conservation bank or conservation entity to respond to effects of climate change, and any failure adequately to do so will in no way diminish or rescind the mitigation credits or benefits assigned to the permittee under this RHCP at the time of the purchase, transfer, or acknowledgement of such credits or benefits. The permittee will cooperate with the Service and the conservation bank or conservation entity by sharing information the permittee has obtained through its

adaptive management program provided for in Chapter 6 of this RHCP, and will encourage the conservation bank or conservation entity to seek advice from the Service about how to implement such knowledge.

8.3 CHANGED CIRCUMSTANCES NOT PROVIDED FOR IN THE RHCP

If additional conservation and mitigation measures are deemed necessary to respond to changed circumstances and such measures were not provided for in the RHCP operating conservation program as specified in Section 8.2, the Service will not require any conservation and mitigation measures in addition to those provided for in the RHCP without the consent of the County, provided the RHCP is being properly implemented.

8.4 UNFORESEEN CIRCUMSTANCES

Unforeseen circumstances are changes in circumstances affecting a species or geographic area covered by a conservation plan that could not reasonably have been anticipated by plan developers and the Service at the time of the conservation plan's negotiation and development, and that result in a substantial and adverse change in the status of the Covered Species. Under the No Surprises rule, with respect to a properly implemented HCP the permittee will not be required to commit additional land, water, money, or financial compensation, or additional restrictions on land, water, or other natural resources to respond to such unforeseen circumstances beyond the level otherwise agreed upon for the species covered by the HCP without the consent of the permittee. Changes in circumstances not provided for in Section 8.2 are considered unforeseen circumstances for purposes of this RHCP.

No Surprises assurances apply to the species (listed and future listed) that are "adequately covered" under this RHCP. Species are considered to be "adequately covered" if the RHCP satisfied the permit issuance criteria contained in ESA section 10(a)(2)(B) with respect to that species. The species considered adequately covered under this RHCP are termed "Covered Species" and described in Chapter 2.

Comal County believes that the Covered Species listed in this RHCP are adequately addressed by the RHCP and are, therefore, covered by the Service's No Surprises policy assurances. In the event that unforeseen circumstances occur during the term of the Permit and the Service concludes that the species are being harmed as a result, the Service may require additional measures of the County where the operating RHCP is being properly implemented only if such measures are limited to modifications within conserved habitat areas, if any, or to the RHCP's operating conservation program for the Covered Species, and maintain the original terms of the RHCP to the maximum extent possible. Additional conservation and mitigation measures will not involve the commitment by the County of additional land, water, money, or financial compensation, or additional restrictions on land, water, or other natural resources otherwise available for development or use under the original terms of the RHCP without the consent of the County.

The Service will have the burden of demonstrating that unforeseen circumstances exist, using the best scientific and commercial data available. The Service shall notify the County in writing of any unforeseen circumstances the Service believes to exist.

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CHAPTER 9 – ALTERNATIVES CONSIDERED BUT NOT ADOPTED

9.1 INTRODUCTION

Section 10(a)(2)(A) of the Endangered Species Act requires that HCPs include a description of the "alternative actions to such taking the applicant considered and the reasons why such alternatives are not being utilized." The HCP Handbook (USFWS and NMFS 1996) states that alternatives to the proposed action commonly considered are those that would reduce take below levels anticipated for the proposed action. The handbook also states that economic reasons for rejecting an alternative are permissible, if the applicant provides data to justify the decisions (to the extent that such data are reasonably available and non-proprietary). Further, the decision regarding which alternative is chosen rests with the applicant. However, the Service retains the authority to reject an application for an incidental take permit if it does not satisfy the requirements of the ESA. Various approaches contained in other RHCPs were considered in developing the proposed RHCP and the alternatives described below.

The alternatives considered during development of the Comal County RHCP include a "No Action" alternative that is required for analysis under NEPA. The No Action alternative reflects the status quo, where Comal County would not have an HCP or a local and comprehensive approach for ESA compliance. The remaining three alternatives that were considered, evaluated, and rejected by Comal County all involve some level of incidental take and include: Maximum Mitigation with Predetermined Preserves, Minimum Mitigation with Predetermined Preserves, and a Land Use Zoning-based RHCP. All three rejected action alternatives are substantially different from the proposed RHCP. However, all three rejected action alternatives have several elements in common with each other and the proposed RHCP (see Section 10.2, below). The rejected alternatives are described and discussed in Sections 9.3–9.5.

9.2 COMMON ELEMENTS TO ALL ALTERNATIVES (EXCEPT NO ACTION)

Elements common to each of the action alternatives, including the proposed action, include:

1. Plan Area: Comal County (359,328 acres; 145,415 hectares).
2. Permit Term: 30 years (2012–2042).
3. Species Included: Covered Species, Evaluation species.
    - Covered Species are the only species for which incidental take would be authorized. All action alternatives include the golden-cheeked warbler and some include the black-capped vireo as Covered Species.
    - Evaluation species include petitioned karst species and Cagle's map turtle; some limited RHCP funds would be expended on tracking and evaluating status of Evaluation Species.

4. Preserve Acquisition Strategy and Criteria
   - Preserve acquisition could be a combination of fee simple acquisition and/or conservation easement(s).
   - Minimum preserve size: 500 acres.
   - Perpetual management and monitoring of all preserves based on Service-approved operation, management, and monitoring plans.
5. Cost Recovery

   Costs of the RHCP would be generated through a possible combination of participation fees, tax benefit financing, private contributions, tax appreciation notes, and open space acquisition bonds.
6. Mitigation and Participation Fees

   Mitigation fees would be based on the amount of species habitat impacted by a project and would be determined by a Service-authorized County representative; actual per-acre fees to be determined and may increase or decrease as the market allows; County may accept preserve land in lieu of fees if appropriate and in line with goals and objectives of the RHCP.

9.3 ALTERNATIVE 1: NO ACTION

Under the No Action alternative, Comal County would not seek an incidental take permit for any endangered or threatened species known from the County, nor would it develop an RHCP for any of these species. Comal County citizens and business interests seeking authorization for incidental take of endangered species would have the responsibility of obtaining individual permits from the Service and developing a separate HCP for each proposed project. The No Action alternative would leave the burden on the landowner of the high costs and unpredictable and lengthy timelines associated with preparing individual HCPs and applying for permits. Consequently, this alternative would not help promote the otherwise lawful and desired economic development in the County.

Several other disadvantages to both Comal County and the endangered species make this alternative unfavorable. The No Action alternative would result in continued regulatory uncertainty for landowners in the County with regard to endangered species. Accurate, consistent, and clear information regarding the biology, habitat, distribution, and management of the species named as "Covered Species" and "Evaluation Species" in the proposed RHCP, and terms for compliance with the ESA, would not generally be known and would not easily be accessible to the public. As a result, landowners' specific responsibilities under the ESA, such as how to minimize or mitigate for potential impacts, would not be well defined or consistent. It is unlikely that clear recommendations based on sound biological research would be developed and distributed to the public in the near future.

The No Action alternative would not encourage the voluntary management or habitat conservation of endangered species known from Comal County on private lands. Conservation on private lands is necessary for the continued existence and recovery of the endangered Covered Species. However, many landowners have difficulty accepting currently available options for land uses that are compatible with Service-recommended conservation actions for the listed bird species. This is due either to decreased economic value of property containing the listed species or to lack of obvious incentives for the landowner.

The status of the Covered and Evaluation Species in Comal County would not likely significantly improve under the No Action alternative. Because the burden of the lengthy and expensive planning and incidental take permit application process would fall on individual landowners, they might be unwilling or unable to seek a permit for common activities, such as single-family home construction, and thereby contribute to the incremental loss of endangered species habitat through unauthorized incidental take. This would potentially lead to a further decline in the available habitat for endangered species in Comal County.

Individual HCPs are less likely to conserve endangered species than a regional, coordinated effort. An organized research program addressing the status and ecology of the Covered and Evaluation Species to aid conservation efforts is currently lacking, and private landowners are not encouraged to partner in such research. Considering the best scientific information currently available, management and conservation efforts conducted under the No Action alternative could proceed under the unsupported assumptions regarding the biology and habitat of the Covered and Evaluation Species and unknowingly decrease the recovery potential of the species.

Under the No Action alternative, the County would not receive the authorization afforded by an incidental take permit for its own activities, such as construction and maintenance of County roads and parks. Additionally, the County would not receive the revenues generated by the RHCP through participation fees and other potential funding sources.

This alternative was rejected for the following reasons:

- The No Action alternative does not meet Comal County's anticipated needs for facilitating ESA compliance for landowners, including the County.
- It does not foster a countywide comprehensive and coordinated endangered species conservation plan.
- It does not contribute to one of the County's objectives of preserving natural open space.

Additional discussion regarding the potential benefits and impacts resulting from this alternative is included in the Environmental Impact Statement.

9.4 ALTERNATIVE 2: MAXIMUM MITIGATION WITH PREDETERMINED PRESERVES

This alternative was designed to reduce impacts to the listed species and the short- and long-term financial obligations of the County for the administration and implementation of the RHCP. Compared with the proposed RHCP, the alternative would provide similar benefits to Comal

County in terms of streamlining the development process relative to compliance with the ESA, it would provide a greater measure of protection (larger preserve system) for the Covered Species, and would authorize more take of the golden-cheeked warbler.

In this alternative, a "target area" for preserve acquisition would be identified in the RHCP and Comal County would agree, up-front, to acquire or otherwise protect and manage in perpetuity approximately 10,500 acres (4,249 hectares) of golden-cheeked warbler preserves (while habitat acquisition would be primarily focused on high-quality golden-cheeked warbler habitat, black-capped vireos would likely benefit as well). This amount of preserved habitat would fully mitigate (at a 1:1 ratio) the take of the golden-cheeked warbler, countywide, over the 30-year life of the RHCP in all habitat areas that were not included in the 10,500-acre preserve system. Once the RHCP was in place, under this alternative, development would be allowed outside the designated preserve area without the need for individual take permits under the ESA.

The premise of this alternative recognizes that, by protecting an appropriate amount of high-quality habitat for the golden-cheeked warbler up-front, the impacts caused by development in the remainder of the permit area would be adequately minimized and mitigated. In addition, this alternative recognizes that the upfront purchase of preserves would be more cost effective than if the preserves were purchased over time.

As with the proposed RHCP, this alternative would seek a permit allowing for up to 1,000 acres of black-capped vireo habitat to be impacted over the life of the RHCP. To mitigate for take associated with this impact, a mitigation program would be established in which participation fees would be collected prior to land disturbance for anticipated impacts to black-capped vireo habitat. Opportunities would be assessed annually, including within designated golden-cheeked warbler preserves, for using these accumulated funds to acquire, create, restore, enhance, and manage protected black-capped vireo habitat at a 1:1 mitigation ratio.

Alternative Summary:

Preserve System Size:	10,500 acres of golden-cheeked warbler habitat at 30-year permit term
Take Authorized:	All take of golden-cheeked warbler occurring outside of designated RHCP preserves; up to 1,000 acres for the black-capped vireo
Acquisition Schedule:	Four years[37]
Initial Acquisition Costs:	$157,500,000 (10,500 acres @ $15,000/acre)

Alternative 2 was rejected for the following reasons:

- At the present time it is not feasible to identify all the preserve land needed to meet the goals of the alternative within the time frame designated for preserve acquisition;

[37] State law includes a provision that predetermined preserves in HCPs must be purchased no later than within four years of the permit being issued (Texas Parks and Wildlife Code, § 83.018(c)).

- The costs associated with acquiring all the needed land and mitigation credits in such a short timeframe and before the RHCP generates substantial income to help defray costs would not be economically feasible for the County.

9.5 ALTERNATIVE 3: MODERATE MITIGATION WITH PREDETERMINED PRESERVES

This alternative would include the purchase up-front, and perpetual protection of approximately 5,250 acres (2,125 hectares) of high quality golden-cheeked warbler habitat. This amount of preserved habitat would authorize 5,250 acres of incidental golden-cheeked warbler take at a 1:1 mitigation ratio. Black-capped vireo take would be authorized and mitigated with a conservation bank similar to that described for the proposed RHCP and Alternative 2. This alternative requires lower expenditures in the first four years of the RHCP than Alternative 2 and allows the County to more closely balance its need to acquire preserve lands based on the demand for incidental take authorization. While this alternative is not as expensive as Alternative 2 due to the lesser amount of eventual preserve acreage anticipated, accelerating land prices throughout the 30-year life of the RHCP will result in higher land acquisition costs compared to purchasing preserves upfront.

As with proposed RHCP and Alternative 2, this alternative would seek a permit allowing for up to 1,000 acres of black-capped vireo habitat to be taken over the life of the RHCP. To mitigate for this take, a mitigation program would be established in which participation fees would be collected prior to land disturbance for anticipated impacts to black-capped vireo habitat. Opportunities would be assessed annually for using these accumulated funds to acquire, create, restore, enhance, and manage protected black-capped vireo habitat at a 1:1 ratio.

Alternative Summary:

Preserve System Size:	5,250 acres of golden-cheeked warbler habitat at 30-year permit term
Take Authorized:	5,250 acres for the golden-cheeked warbler; up to 1,000 acres for the black-capped vireo
Acquisition Schedule:	1,000 acres initial acquisition (2011), 4,250 acres (1,720 hectares) added to preserve system by 2015
Initial Acquisition Costs:	$15,000,000 in 2011 (1,000 acres @ $15,000/acre); up to $85,000,000 more by 2013 (4,250 acres @ $20,000/acre)

Alternative 3 was rejected because the costs associated with acquiring all the needed land and mitigation credits in such a short timeframe and before the RHCP generates substantial income to help defray costs would not be economically feasible for the County.

9.6 ALTERNATIVE 4: REDUCED TAKE RHCP

The Reduced Take RHCP would be the same as the proposed RHCP except:

- only the golden-cheeked warbler would be covered by the incidental take permit;
- the amount of covered take, and the mitigation required for the take, would be reduced; and
- the anticipated participation rate would be at 20 percent, the low end of the range identified above and discussed in Chapter 2, Section 2.3 of this document. Compared to the proposed RHCP, a lower participation rate in this alternative is consistent with the reduced number of species and amount of take covered by the permit.

This alternative assumes that the Covered Species would be limited to the golden-cheeked warbler. The black-capped vireo would not be covered by the requested permit.

Compared to the proposed RHCP, the lower anticipated participation rate (20% rather than 50%) would reduce impacts of participating projects to warbler habitat from 5,238 acres to 2,095 acres 848 hectares), a 60 percent reduction. Mitigation for 2,095 acres of impact would include the establishment of up to an estimated 2,619 acres (1,060 hectares) of preserves. Similar to the proposed RHCP, the mitigation ratio in the Reduced Take RHCP would vary according to various conditions, including habitat quality, with an estimated 80 percent of participating projects mitigating at 1:1, 15 percent mitigating at 2:1, and 5 percent mitigating at 3:1. Once the mitigation credits (an estimated 2,619 credits) were exhausted, no additional take or mitigation would be authorized for the golden-cheeked warbler under the plan without an amendment to the RHCP. The Reduced Take RHCP alternative would include a research program, but at $8,000 per year for the permit term that program would be allotted less funding than the proposed RHCP. The Reduced Take RHCP would also include a public awareness program that would be funded at $4,000 per year for the life of the permit. Finally, the Reduced Take RHCP would establish an endowment fund of $6,600,000 by the end of the permit term for the purpose of funding management and monitoring of RHCP preserves.

9.7 ALTERNATIVE 5: LAND USE ZONING-BASED RHCP

Under this alternative, an RHCP would be developed based on land use zoning. The County would identify areas significant to the conservation of the Covered Species, and through a land use zoning effort, limit development activities in those areas. Similar to Alternative 2, this alternative was designed to reduce take of the listed species; however, it was considered primarily because precedents exist for this approach, most recently by countywide habitat conservation planning in Pima County, Arizona (RECON 2006). Alternative 5 would be modeled on the Pima County Multi-species Conservation Plan, which is summarized below.

Pima County has a zoning ordinance in place that regulates land use in all unincorporated areas of the county within its jurisdiction, over 600,000 acres (242,800 hectares). The existing zoning pertains unless a developer submits a request to change the zoning on an area or to increase the density above that for which it is already zoned. In that case, if the area falls within a new countywide Conservation Land System, new conditions apply. The Conservation Land System,

which was developed by Pima County in collaboration with Federal, state, and municipal land management entities, classifies some 2 million acres (809,000 hectares) within that county into seven categories, each with accompanying conservation guidelines. In the most restrictive categories (Biological Core Management Areas, Special Species Management Areas, and Important Riparian areas), from 80 to 95 percent of the total acreages in those categories must be conserved or enhanced as wildlife habitat, depending on the classification. Development on any given property is restricted to the least sensitive portions of that property.

Under Alternative 5, Comal County would have to establish a zoning program, including expanded authority for issuing land use-related discretionary permits and a system for monitoring zoning compliance and enforcing sanctions for zoning violations. Adherence to zoning designed to protect conservation values, specifically those pertaining to the Covered Species, would provide a mitigation framework for take authorized by the requested incidental take permit. Participation in the RHCP would not be voluntary because zoning stipulations would apply to all property within Comal County's jurisdiction. Compared to the proposed RHCP, the amount of permitted take, the mitigation required for the take, and the costs associated with mitigation would likely be reduced (depending on the outcome of the zoning process); annual expenditures for administration and implementation of the RHCP would likely increase due to the initial zoning efforts and monitoring of land use compliance; and the anticipated participation rate would be higher as participation in the land use zoning would be required.

Alternative 3 would provide benefits to Comal County in terms of streamlining the development process relative to compliance with the ESA, and it would provide a significant measure of protection for the Covered Species and Evaluation Species. However, the alternative was rejected because, at this time, Comal County does not have the regulatory authority to implement land use zoning, and the County is unlikely to gain that authority from the Texas Legislature given the strong tradition of protecting private property rights in the state. In Texas, a county has only the authority expressly granted it by the State constitution or State statutes. No county in Texas has general ordinance-making authority, although in several cases, the state legislature has authorized a county or counties to enact rules or ordinances in regard to a specific issue. For example, certain counties may adopt zoning ordinances in limited areas around particular features, such as Padre Island beachfront or specific lakes (Texas Local Government Code, Chapter 231). The regulatory authority granted to all counties in the state is limited to automotive wrecking and salvage yards (Texas Transportation Code § 396.041), wild animals (Local Government Code § 240.002), mass gatherings (Health and Safety Code, Chapter 751), and residential subdivision plats[38] in unincorporated areas (Local Government Code, Chapter 232). Specifically, a subdivision plat must be approved by the applicable county commissioners court and filed with the county clerk as a permanent real property record, where it may be used for land title research, land sales, or property tax purposes. Before approving a plat, a commissioners court may require rights-of-way on subdivision roads, reasonable specifications on road construction and drainage infrastructure, and purchase contracts to specify the availability of water (Local Government Code § 232.003).

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[38] A plat is a legal document that includes a map of the subdivided property and public improvements, such as streets or drainage infrastructure.

Alternative 5 was rejected because the limited authority of Texas counties does not include the right to establish land use zoning to protect conservation values and interests.

9.8 ALTERNATIVE 6: COUNTY-ONLY RHCP ALTERNATIVE

Under this alternative, the RHCP would cover only listed species impacts associated with activities of Comal County, such as road construction and maintenance and flood-control projects. While Comal County will occasionally require ESA authorization for its infrastructure projects, it was determined that the long-term demand associated with County-only projects will be insufficient to establish a meaningful preserve system for the covered species. For example, the County recently provided mitigation for activities relating to a flood-control project on a tributary to Dry Comal Creek, but it was able to provide satisfactory mitigation on-site and with a relatively small number of acres. In addition, this alternative would not materially reduce the workload of the Service relating to processing ESA authorizations within the County, nor would this alternative have the effect of encouraging broader compliance by providing more efficient ESA compliance alternatives to other governmental and non-governmental entities within the County. For the foregoing reasons, this alternative was rejected for further analysis.

GLOSSARY AND ABBREVIATIONS

Aquifer: Rocks or sediments, such as cavernous limestone and unconsolidated sand, that store, conduct, and yield water in significant quantities for human use.

Balcones Canyonlands National Wildlife Refuge: Located in Travis and Burnet Counties north of Lake Travis. The primary purpose of the refuge is to conserve the nesting habitat of the endangered golden-cheeked warbler and black-capped vireo. The Balcones Canyonlands National Wildlife Refuge is planned to include 46,000 acres (18,616 hectares) within an 80,000-acre (32,374-hectare) "acquisition boundary." Current holdings total approximately 21,400 acres (8,660 hectares).

Balcones Canyonlands Conservation Plan: The regional habitat conservation plan covering western Travis County. The Balcones Canyonlands Conservation Plan calls for the creation of a preserve system to protect eight endangered species as well as 27 other species believed to be at risk. The Balcones Canyonlands Conservation Plan was approved by the Service in 1996 and has a 30-year term. It allows for incidental take outside of proposed preserve lands, and provides mitigation for new public schools, roads and infrastructure projects of the participating agencies (Travis County, the City of Austin, and the Lower Colorado River Authority). Landowners and developers may elect to participate in the Balcones Canyonlands Conservation Plan to obtain Endangered Species Act take authorization rather than by seeking authorization directly from the Service.

Biological advisory team: Three or more professional biologists retained to provide guidance for the RHCP, especially with respect to the calculation of harm to the endangered species and the size and configuration of the habitat preserves. The Texas Parks and Wildlife Code § 83.015(c) requires a biological advisory team for RHCPs and specifies that at least one member shall be appointed by the Texas Parks and Wildlife Commission and one by landowner members of the citizens advisory committee. The members of the biological advisory team for this RHCP are experts on the species covered by the RHCP.

Biological Opinion: The Service document issued at the conclusion of formal consultation pursuant to section 7(a)(2) of the Endangered Species Act that generally includes: (1) the opinion of the U.S. Fish and Wildlife Service as to whether or not a Federal action is likely to jeopardize the continued existence of listed species, or result in the destruction or adverse modification of designated critical habitat; (2) a summary of the information on which the opinion is based; and (3) a detailed discussion of the effects of the action on listed species or designated critical habitat (50 CFR §§ 402.02, 402.14(h)).

Candidate species: Candidate species are those species that are actively being considered for listing as endangered or threatened under the ESA, as well as those species for which the Service has initiated an ESA status review that it has announced in the *Federal Register*.

Carrying capacity: The maximum number of individuals of a species that a particular area of habitat is able to support.

Cave: A naturally occurring, humanly enterable cavity in the earth, at least 16 feet in length and/or depth, in which no dimension of the entrance exceeds the length of depth of the cavity (definition of the Texas Speleological Society).

Certificate of Inclusion: A document used with a programmatic or "umbrella" Safe Harbor Agreement, Candidate Conservation Agreement with Assurances, or Habitat Conservation Plan certifying that property enrolled by an individual landowner is included within the scope of a programmatic enhancement of survival permit that authorizes incidental take of a species.

CFR: *See Code of Federal Regulations*

Citizens advisory committee: Texas Parks and Wildlife Code § 83.016 requires that the plan participants appoint a citizens advisory committee to assist in preparing the RHCP and application for the Federal permit. The state law requires that at least 4 members, or 33 percent, of the citizens advisory committee, whichever is greater, must own undeveloped land or land in agricultural use in the RHCP area. The law also specifies that a landowner member may not be an employee or elected official of a plan participant or any other governmental entity and that the Texas Parks and Wildlife Commission shall appoint one voting representative to the citizens advisory committee.

Code of Federal Regulations (CFR): A compilation of the general and permanent rules of the executive departments and agencies of the Federal Government as published in the *Federal Register*. The code is divided into 50 titles that represent broad areas subject to Federal regulation.

Conservation plan: *See habitat conservation plan*

Consultation: A process that: (1) determines whether a proposed Federal action is likely to jeopardize the continued existence of a listed species or destroy or adversely modify designated critical habitat; (2) begins with a Federal agency's written request and submittal of a complete initiation packet; and (3) concludes with the issuance of a Biological Opinion and incidental take statement by the Service. If a proposed Federal action may affect a listed species or designated critical habitat, formal consultation is required (except when the Service concurs, in writing, that a proposed action "is not likely to adversely affect" listed species or designated critical habitat). In the context of an HCP, the consultation is an "intra-service" consultation within the pertinent Service departments (50 CFR §§ 402.02, 402.14).

Covered Species: The federally listed species to be included on and covered by a section 10(a)(1)(B) incidental take permit.

Delist: To remove a species from the Federal list of endangered and threatened species (50 §§ 17.11 and 17.12) because the species no longer meets any of the five listing factors provided under section 4(a)(1) of the Endangered Species Act and under which the species was originally listed (i.e., because the species has become extinct or is recovered).

Downlist: To reclassify an endangered species to a threatened species based on alleviation of any of the five listing factors provided under section 4(a)(1) of the Endangered Species Act (16 USC § 1533(a)(1)).

Endangered species: "any species [including subspecies or qualifying distinct population segment] which is in danger of extinction throughout all or a significant portion of its range" (section 3(6) of Endangered Species Act, 16 USC § 1532(6)).

Endangered Species Act of 1973, as amended (ESA): 16 USC §§ 1513–1543; Federal legislation that provides means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, and provides a program for the conservation of such endangered and threatened species.

Endemic: Being native and restricted to a particular geographic region.

Environmental Impact Statement: A detailed written statement required by section 102(2)(C) of the National Environmental Policy Act (NEPA) containing, among other things, an analysis of environmental impacts of a proposed action and alternatives considered, adverse effects of the project that cannot be avoided, alternative courses of action, short-term uses of the environment versus the maintenance and enhancement of long-term productivity, and any irreversible and irretrievable commitment of resources (40 CFR §§ 1508.11, 1502).

ESA: *See Endangered Species Act of 1973, as amended*

Evaluation Species: Species addressed in the Comal County RHCP but not covered by the Permit. These species are not currently listed but are either currently suggested to be listed in citizens' petitions to the Service or may be sufficiently rare and/or threatened within the County that a reasonable possibility exists that they will be considered for listing during the Permit term.

Federally listed: Included in the list of endangered or threatened species maintained by the U.S. Fish and Wildlife Service and the National Marine Fisheries Service under section 4 of the Endangered Species Act of 1973, as amended, and therefore protected by the Act.

Habitat: The location where a particular taxon of plant or animal lives and its surroundings, both living and non-living; the term includes the presence of a group of particular environmental conditions surrounding an organism including air, water, soil, mineral elements, moisture, temperature, and topography.

Habitat conservation plan (HCP): Under section 10(a)(2)(A) of the Endangered Species Act, a planning document that is a mandatory component of an incidental take permit application, also known as a "section 10(a)" or "HCP."

Harm: Defined in regulations promulgated by the Department of the Interior to implement the Endangered Species Act as an act "which actually kills or injures" listed wildlife. Harm may include "significant habitat modification or degradation where it actually kills or injures wildlife

by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering" (50 CFR § 17.3 (2005)).

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 disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, and sheltering (50 CFR § 17.3).

Incidental take: Take of any federally listed wildlife species that is incidental to, but not the purpose of, otherwise lawful activities (see definition for "take") (Endangered Species Act section 10(a)(1)(B)).

Incidental take permit: A permit that exempts a permittee from the take prohibition of section 9 of the Endangered Species Act issued by the Service pursuant to section 10(a)(1)(B) of the Endangered Species Act. Also sometimes referred to as a "section 10(a)(1)(B)," or "section 10 permit."

Listed species: Species listed as either endangered or threatened under section 4 of the Endangered Species Act (16 USC § 1533).

Mitigation: Under National Environmental Policy Act (NEPA) regulations, to moderate, reduce or alleviate the impacts of a proposed activity, including: (1) avoiding the impact by not taking a certain action or parts of an action; (2) minimizing impacts by limiting the degree or magnitude of the action; (3) rectifying the impact by repairing, rehabilitating or restoring the affected environment; (4) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; or (5) compensating for the impact by replacing or providing substitute resources or environments (40 CFR § 1508.20). Under the Endangered Species Act, the applicant must demonstrate that the applicant will, to the maximum extent practicable, undertake to minimize and mitigate the impacts of take of species. According to the HCP Handbook, typical mitigation actions under HCP and incidental take permits include the following: (1) avoiding the impact (to the extent practicable); (2) minimizing the impact; (3) rectifying the impact; (4) reducing or eliminating the impact over time; or (5) compensating for the impact.

National Environmental Policy Act (NEPA): Federal legislation establishing national policy that environmental impacts will be evaluated as an integral part of any major Federal action. Requires the preparation of an Environmental Impact Statement for all major Federal actions significantly affecting the quality of the human environment (42 USC §§ 4321–4327).

NEPA: *See National Environmental Policy Act*

NMFS: National Marine Fisheries Service

No Surprises rule: The regulation entitled "Habitat Conservation Plan Assurances 'No Surprises' Rule" that provides participants in an approved HCP the assurance that the Service will not impose additional mitigation requirements, even if environmental conditions

change over time and negatively impact the species (63 FR 8859, codified at 50 CFR §§ 17.22, 17.32, 222.2).

RHCP participant: Any non-Federal party desiring to undertake activities covered by the RHCP, who agrees to comply with the terms and conditions of the RHCP.

Recovery Plan: Section 4(f) of the Endangered Species Act, 16 USC § 1533(f), requires that the Service develop and implement recovery plans for the conservation and survival of listed species, unless the Service finds that such a plan will not promote the conservation of the species. Recovery plans are required to include (1) a description of site-specific management actions necessary to achieve the plan's goal for conservation and survival of the species, (2) objective, measurable criteria which, when met, would result in the species' removal from the list, and (3) estimates of the time and cost required to achieve the recovery goals. The Service has developed recovery plans for the black-capped vireo and the golden-cheeked warbler (USFWS 1991 and USFWS 1992, respectively).

Regional habitat conservation plan (RHCP): An RHCP typically covers a large geographic area, numerous landowners, and multiple species. Local or regional authorities or entities are often the applicant and permittee, and may be relied upon to implement the mitigation plan under an RHCP (see HCP).

RHCP: *See regional habitat conservation plan*

Section 7: The section of the Endangered Species Act that describes the responsibilities of Federal agencies in conserving threatened and endangered species. Section 7(a)(1) requires all Federal agencies "in consultation with and with the assistance of the Secretary [to] utilize their authorities in furtherance of the purposes of this Act by carrying out programs for the conservation of endangered species and threatened species." Section 7(a)(2) requires Federal agencies to "ensure that any action authorized, funded, or carried out by such agency...is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of..." designated critical habitat.

Section 9: The section of the Endangered Species Act dealing with prohibited acts, including the take of any listed species without specific authorization of the Service.

Section 10: The section of the Endangered Species Act dealing with exceptions to the prohibitions of section 9 of the Endangered Species Act.

Section 10(a)(1)(A): That portion of section 10 of the Endangered Species Act that allows for permits for the taking of threatened or endangered species for scientific purposes or for purposes of enhancement of propagation or survival.

Section 10(a)(1)(B): That portion of section 10 of the Endangered Species Act that authorizes the Service to issue permits for the incidental take of threatened or endangered species.

Service: United States Fish and Wildlife Service

SWCA: SWCA Environmental Consultants

Take: Under section 3(18) of the Endangered Species Act, "…to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" with respect to federally listed endangered species of wildlife. Federal regulations provide the same taking prohibitions for threatened wildlife species (50 CFR § 17.31(a)).

TCEQ: Texas Commission on Environmental Quality

Threatened species (Federal): "Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range" (Endangered Species Act, 16 USC § 1532(20)).

USC: United States Code

USFWS: United States Fish and Wildlife Service

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[39] Throughout this document and in references listed here, two spellings of the black-capped vireo specific epithet are used: *v. atricapilla* and *v. atricapillus.* The spelling was changed in 2003 and currently is *v. atricapilla* (Banks et al. 2003).

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