MANAGEMENT AND MONITORING

GUIDANCE FROM USFWS 5-POINT POLICY

(Addendum to the 1996 HCP Handbook)
(Federal Register 65: 35242; June 1, 2000)

Adaptive Management

- Adaptive management is an integrated method for addressing uncertainty in natural resource management.
- Elements of an adaptive management strategy in an HCP:
    1. Identify the uncertainty and the questions that need to be addressed to resolve the uncertainty;
    2. Develop alternative strategies and determine which experimental strategies to implement;
    3. Integrate a monitoring program that is able to detect the necessary information for strategy evaluation; and
    4. Incorporate feedback loops that link implementation and monitoring to a decision-making process (which may be similar to a dispute-resolution process) that result in appropriate changes in management.
- No Surprises: When an HCP, permit, and IA, if used, incorporate an adaptive management strategy, it should clearly state the range of possible operating conservation program adjustments due to significant new information, risk, or uncertainty. This range defines the limits of what resource commitments may be required of the permittee. This process will enable the applicant to assess the potential economic impacts of adjustments before agreeing to the HCP.

Monitoring

- Should provide the information necessary to assess compliance and project impacts, and verify progress toward the biological goals and objectives.
- Types of monitoring
    1. Compliance monitoring
    2. Effects and effectiveness monitoring
- Scope of the monitoring plan should be commensurate with the scope and duration of the conservation program and project impacts.
- Monitoring program should be based on measurable biological goals and objectives.
- Effects and effectiveness monitoring includes, but is not limited to, the following:
    1. Periodic accounting of incidental take that occurred in conjunction with the permitted activity;
    2. Surveys to determine species status, appropriately measured for the particular operating conservation program (e.g., presence, density, or reproductive rates);
    3. Assessments of habitat condition;
    4. Progress reports on fulfillment of the operating conservation program (e.g., habitat acres acquired and/or restored); and

5. Evaluations of the operating conservation program and its progress toward its intended biological goals.

- The USFWS and the permittee are responsible for monitoring the implementation of the HCP. The Service's primary monitoring responsibilities (with the assistance of the permittee) are ensuring compliance with the permit's terms and conditions, including proper implementation of the HCP by the permittee.

SUMMARIES OF OTHER TEXAS HCPs

Following are summaries of other Texas HCPs that were designed primarily to include terrestrial species. Appended to this guidance document are full versions of the major sections for each HCP listed, as back-up material for further research, if desired.

Comal County RHCP

Current draft is April 2010. This is perhaps the simplest HCP among those compared herein. (See the attached pages 6-1 through 6-4.)

- Gives a general description of Adaptive Management.
- Adaptive Management Working Group (possibly including County representative, USFWS, TPWD, citizens, biologists) will meet at least twice a year.
- Identifies an Adaptive Management Framework, including:
  - Every 5 years, evaluate and report on preserve status .and habitat quality improvement or deterioration;
  - Every 5 years, research update on covered species;
  - Every year, evaluate and report on conservation benefits, and what additional measures the County could implement; and
  - Every year, determine levels of expected impact and existing protected areas for Evaluation Species and decide whether to seek permit coverage.
- Biological and Compliance Monitoring section briefly describes a baseline evaluation, management and monitoring plan preparation, boundary assessment 4 times/year, biological monitoring, annual report.

Hays County RHCP

Current draft is the final draft, dated June 22, 2010. This plan is very detailed and prescriptive, especially for management and monitoring. (See the attached pages 70-89 and 102-103.)

- Describes a cyclical, adaptive process involving the following general steps:
  - Documenting baseline preserve conditions;
  - Evaluating threats to the covered species and their habitat;
  - Implementing management plans; and
  - Monitoring populations of the covered species and their habitats to track the results of management practices or programs, identify trends in populations and habitat conditions, and evaluate whether the management program successfully maintained the conservation value of the preserve system.
- Details requirements for Baseline Preserve Evaluations and Land Management Plans.

- Includes fine details for Preserve Monitoring and Reporting (8 pages).
- Schedule for Major Preserve Management and Monitoring Tasks, including:
  - Years ending in 0 or 5: Territory Mapping Surveys;
  - Years ending in 1 or 6: Habitat Occupancy Surveys;
  - Years ending in 2 or 7: Habitat Monitoring Surveys;
  - Years ending in 3 or 8: Baseline Preserve Evaluations; and
  - Years ending in 4 or 9: Land Management Plans.
- Gives detailed guidance regarding Management of Public Access and Other Preserve Uses, including:
  - Definitions and allowances for passive and active public use
  - Provisions for Management of Public Access and Other Preserve Uses (existing or new).
- Details Adaptive Management Provisions, including:
  - Uncertainty in the Effectiveness of the Preserve Design Criteria
  - Strategies for Dealing with Uncertainty in the Preserve Design Criteria
  - Monitoring to Assess the Effectiveness of the Preserve Design Criteria
  - Process for Revising Preserve Design Criteria

Williamson County RHCP

The final plan is dated August 15, 2008. Like the Comal plan, this plan is also very simple in its description of management and monitoring. (See attached pages 7-1 through 8-4.)

- Includes a general overview of Adaptive Management.
- Adaptive Management Working Group (possibly including County representative, USFWS, TPWD, citizens, biologists) will meet at least twice a year. Will review the annual report and make recommendations for changes in management directions.
- Identifies an Adaptive Management Framework for the following purposes:
  1. Identifying areas of uncertainty and questions that need to be addressed to resolve uncertainty;
  2. Developing alternative management strategies and determining which experimental strategies to implement;
  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 decisionmaking process that result in appropriate changes in management.
- Species and Habitat Tracking Process
  - Development of a database for covere and additional species, including known locations, population numbers, etc.;
  - Annual evaluation of increase or decrease in known locations (early warning system);
  - Literature and research update every 5 years;

- Coordination of a species status assessment, if new information is available;
- Following the species status assessment, an evaluation of conservation benefits and possible additional measures;
- Depending on the evaluation of benefits, determine the levels of expected impact and existing protected areas for the additional species and decide whether to seek coverage of the species; and
- As information identified above becomes available, or one or more of the additional species becomes listed and coverage is desired, at a minimum the Service and the County will need to amend the RHCP, the Permit, and the Biological Opinion to allow for inclusion on the Permit.

BCP Land Management Plan

The Balcones Canyonlands Conservation Plan (BCCP) was approved in May 1996. (See the attached Tier II-A, Chapter 1, which was re-approved in November 2007.) The complete Balcones Canyonlands Preserve (BCP) Land Management Plan is available on the City of Austin BCP web site.

The BCCP did not include Adaptive Management provisions as described by the Five-Points Policy, which came after the BCCP was approved. The BCCP also did not include a detailed plan for species monitoring. The BCCP includes a hierarchical land management planning document and process that evolved after the plan was approved and which was designed to accommodate the dual permit holders and multiple managing partners.

OTHER CONSIDERATIONS

Land management considerations and land management entities will be affected by land conservation method (i.e., fee simple acquisition or conservation easement).

- Public expectations for recreational access will be greater for land that is conserved by fee simple acquisition.
- Neighboring property owners may also take special liberty with public land more frequently than private land that has a conservation easement.

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.[31] 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.

[31] 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, 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.

include publicly owned lands for water quality protection, privately owned lands protected by conservation easements, lands used by academic institutions for agricultural and natural resource research, and parks and greenbelts. Each of these areas is largely protected from future land development; however, the primary purpose of these protected lands may not be for the conservation of endangered species.

The previously protected lands in Hays County may include approximately 9,880 acres of potential golden-cheeked warbler habitat, based on the Loomis warbler habitat model (see Section 4.2.1.3). It is likely that some of these tracts also contain suitable habitat for the black-capped vireo. Many of these previously protected properties occur over the Edwards Aquifer recharge zone and karst terranes, and some contain karst features known to include one or more of the evaluation or additional species addressed in the RHCP. Though the protected lands appear not to be managed specifically for endangered species protection, the previously protected open spaces may have a role in the RHCP preserve system.

Hays County may seek opportunities to partner with the owners and managers of previously protected open space lands to explicitly protect and manage habitat for the golden-cheeked warbler, black-capped vireo habitat, and other species of concern on these lands. With the approval of the USFWS, increasing conservation value for warbler and/or vireo habitat on previously protected lands may generate mitigation credits (albeit at a reduced rate) for the RHCP on a case-by-case basis. Any areas of warbler or vireo habitat within previously protected open spaces for which the USFWS agrees to award mitigation credits to the RHCP will be permanently protected and managed in accordance with the terms of the Permit.

Previously protected open space parcels may help RHCP preserve parcels meet the recommended minimum preserve block size (i.e., 500 acres), even if the previously protected parcels are not included in the RHCP preserve system. For example, if a potential RHCP preserve parcel containing approximately 200 acres is adjacent to a 400-acre parcel of previously protected open space (such as one of the existing conservation easements in Hays County), the potential RHCP preserve parcel may be considered to have met the recommended minimum preserve block size since the total size of the permanently protected block of open space would exceed 500 acres.

6.4 Preserve Management and Monitoring Program

6.4.1 Management and Monitoring Objectives

All RHCP preserve lands, including County-owned preserve parcels and parcels included in the preserve system via conservation easements or other agreements, will be managed in perpetuity in accordance with the terms of the Permit and the RHCP. The County will also manage RHCP preserve lands in accordance with all other applicable local, state, and federal laws.

The objective of the RHCP preserve management and monitoring program is to maintain the conservation value of the preserve system in perpetuity. Maintaining the conservation value of the preserve system involves eliminating or minimizing threats that could decrease the extent or quality of potential habitat for the covered species within the preserve system, compared to the condition of that habitat at the time of acquisition. The County may elect to, but will not be required, to implement management practices that are designed to increase or enhance the mitigation value of a preserve parcel after acquisition to meet the mitigation commitment under the RHCP.

The RHCP preserve management and monitoring program is a cyclical, adaptive process involving the following general steps:

1. Documenting baseline preserve conditions to provide the basic information needed to inform management and monitoring decisions;
2. Evaluating threats to the covered species and their habitats within the preserve system and planning appropriate management strategies and practices to eliminate or minimize such threats;
3. Implementing management plans; and
4. Monitoring populations of the covered species and their habitats to track the results of management practices or programs, identify trends in populations and habitat conditions, and evaluate whether the management program successfully maintained the conservation value of the preserve system. Monitoring data feeds back into updated baseline evaluations and the cycle repeats.

Specific provisions and minimum requirements for each of these steps are described in the following sections.

Within six months of Permit issuance, Hays County will prepare standard methodologies and formats for the content of required preserve management documents, including the baseline preserve evaluations, land management plans, and annual reports. These documents will be reviewed and approved by the USFWS before use. Hays County will implement (or cause to be implemented) all management and monitoring activities in accordance with these standards.

6.4.2 Preserve Managers

Hays County is ultimately responsible for ensuring that the preserve system is managed and monitored in accordance with the terms of the Permit and the RHCP. However, specific planning and implementation activities for individual preserve parcels/blocks may be tasked to designated preserve managers other than the County.

Preserve managers may include the County, a private landowner, or other entity as determined by specific, legally enforceable agreements (such as the terms of a conservation easement or an interlocal agreement). The County will designate a preserve manager (or multiple

preserve managers, if management duties are to be split between parties) for each preserve parcel at the time of acquisition. All preserve managers will be approved by the USFWS. Preserve managers will coordinate with Hays County and the USFWS, as appropriate, to ensure that preserves are managed in accordance with the terms and conditions of the Permit and the management and monitoring program described in the RHCP.

6.4.3 Baseline Preserve Evaluations

Baseline preserve evaluations for RHCP preserve system acquisitions will document the presence and condition of natural and human resources within the preserve. The evaluations will provide the basic information needed to inform management and monitoring decisions for the preserve system.

The baseline preserve evaluations will be prepared for each preserve parcel and the document will be updated at least once every five years, in accordance with the schedule in Section 6.4.6. The preserve manager will be responsible for the preparation of the baseline preserve evaluations and will ensure that qualified biologists conduct the evaluation. Biologists conducting portions of the baseline preserve evaluations for the RHCP that pertain to the covered species or their habitats must hold or be covered by an USFWS Threatened and Endangered Species permit that authorizes the biologist to conduct surveys for the golden-cheeked warbler and black-capped vireo. This standard will help ensure that those conducting habitat assessments for the RHCP are sufficiently familiar with the habitats used by the covered species. Baseline preserve evaluations (and updates to these documents) will be submitted by preserve managers to Hays County by October 31 of the year in which they are prepared.

The baseline preserve evaluation will include the following minimum information:

- The acreage of potential habitat for the golden-cheeked warbler and black-capped vireo present on the parcel, as identified by a habitat determination (see Section 7.4.2).
- A detailed map showing the specific location and extent of potential warbler and vireo habitat on the parcel.
- An estimate of the relative quality of potential warbler and vireo habitat on the parcel and documentation of the habitat characteristics used to justify the quality estimate.
- An estimate of the number of warblers and vireos occurring on the property and the extent (i.e., number of acres) and location of occupied and unoccupied habitat within the parcel.
- A description and map of other major vegetation communities and special or unique habitats on the parcel that may warrant special management consideration.

- A description and map of all structures or other property improvements on the parcel, including the size or aerial extent, condition, and use of such improvements. Improvements to be described include, but are not limited to, buildings, roads or trails, utilities, and dams and impoundments.
- A description and map of all current land uses on the parcel, including areas used for agricultural purposes, recreational purposes, or easements.
- A description and assessment of potential threats to the covered species or their habitats within the preserve system, such as information including (but not limited to) deer, feral hogs, cowbirds, fire ants, and invasive species. Such assessment will also include the potential impacts of land uses (including recreational uses) within or adjacent to the preserve on the covered species or their habitats, as applicable.
- Other information regarding the property that may be relevant to the management of the parcel in accordance with the terms of the Permit and the goals and objectives of the RHCP.

6.4.4 Land Management Plans

Land management plans will direct management actions within specific preserve blocks or parcels in a manner that is consistent with the management objectives described in Section 6.4.1. Each preserve parcel will be covered by a land management plan; although multiple adjacent parcels may be covered under a single plan. The preserve manager will be responsible for the preparation and implementation of the land management plan for that parcel and will ensure that qualified biologists prepare the document. Biologists preparing land management plans for the RHCP must hold or be covered by an USFWS Threatened and Endangered Species permit that authorizes the biologist to conduct surveys for the golden-cheeked warbler and black-capped vireo.

Land management plans will be prepared and/or updated by the preserve manager every five years, in accordance with the schedule in Section 6.4.6, unless the preserve manager finds that changed conditions warrant a revised plan before the next scheduled review date. Hays County may also require the review and revision of a land management plan before the scheduled review date, in order to implement adaptive management provisions, respond to changed circumstances, or otherwise maintain compliance with Permit conditions. Land management plans and subsequent updates will be submitted to Hays County by October 31 of the year in which they are prepared, and the County will submit land management plans to the USFWS for review and approval prior to implementation.

Land management plans will rely on the best available information regarding the biology and management of the covered species and the information contained in the most recent baseline preserve evaluation, as described in Section 6.4.3.

At a minimum, land management plans will address the following topics and incorporate the concepts listed below:

1. Creating and maintaining effective preserve boundaries with adequate fencing and appropriate signage forbidding unauthorized access;
2. Limiting use of areas within the preserve, as appropriate, to only those activities that do not appreciably reduce the conservation value of the preserve;
3. Preserving, reproducing, or enhancing the ecological processes that create and maintain habitat for the covered species, including but not limited to vegetational succession, oak regeneration, and fire management/use of prescribed fire to the extent practicable;
4. Minimizing the effects of land uses adjacent to protected habitat to the extent practicable by:
    a. Managing populations of urban-adapted, non-native, and/or invasive animals within the preserve system, including but not limited to feral cats and dogs, feral hogs, brown-headed cowbirds, white-tailed deer, and red imported fire ants;
    b. Attempting to prevent the introduction and control the establishment or spread of non-native and/or invasive plants within the preserve system (which may include management of Ashe juniper); and
    c. Preventing and/or controlling oak wilt and other diseases or infestations affecting the covered species or their habitats.
5. Choosing preserve management practices that minimize adverse effects to the species addressed by the RHCP;
6. Minimizing the potential negative effects of major vegetation management practices (such as selective clearing practices or prescribed burning to create or maintain black-capped vireo habitat or manage stands of Ashe juniper) by:
    a. Conducting major vegetation management practices outside of the breeding seasons for the covered species (defined as March 1 through July 31 for the golden-cheeked warbler and March 15 through August 31 for the black-capped vireo);
    b. Limiting the extent of major vegetation management activities in potential habitat for covered species (i.e., management activities that could substantially decrease the extent of potential habitat in the treated area) to avoid impacting the majority of such habitat in a preserve block in a single year; and

c. To the extent practicable, choosing specific management practices that minimize the disturbance, removal, or compaction of top soil (thereby preserving soil structure and texture) in the treated area, including but not limited to practices that utilize hand tools instead of heavy equipment or, if it is necessary to use heavy equipment, choosing equipment with rubber tires instead of tracks; and

7. Monitoring the sources and impacts of potential threats to the covered species or their habitats, as applicable to each parcel.

Hays County will not be required to implement management practices that are designed to increase or enhance the mitigation value of a preserve block after acquisition to meet the mitigation commitment under the RHCP. However, additional management and monitoring objectives are included in Appendix E to help guide the implementation of such activities should the County have the additional resources and desire to do so. Implementation of management activities to achieve these additional management objectives is not required to meet the mitigation commitments under the RHCP and the Permit; nor is implementation of this additional guidance necessary to meet the ESA incidental take permit issuance criteria.

6.4.5 Preserve Monitoring and Reporting

The preserve manager will be responsible for completion of all required preserve monitoring and reporting for that parcel and will ensure that qualified biologists conduct the work. All personnel conducting surveys or other monitoring studies within the preserve system for the covered species or their habitats will hold or be covered by a valid USFWS Threatened and Endangered Species permit that authorizes the biologist to conduct surveys for the golden-cheeked warbler and black-capped vireo.

Required monitoring studies within the preserve system will include regular surveys of populations of the covered species and habitat characteristics for the covered species according to the schedule in Section 6.4.6. Standard methods and minimum procedures for these required monitoring studies are specified below and will apply to all preserve parcels within the RHCP preserve system.

In addition to the required species and habitat monitoring, potential threats to the covered species and their habitats within the preserve system will also be regularly monitored, as applicable to each preserve parcel. Types of threat monitoring could include measuring populations of predator/competitor species, invasive plants or infestations/diseases, or the effects of public access or other preserve uses. In terms of threats to populations of and habitats for the covered species, the monitoring needs of preserve parcels will likely differ across the preserve system and may change over time. Therefore, the threats monitoring program for each preserve parcel will be described within the land management plan for that parcel.

Hays County will submit all reports documenting the results of monitoring surveys within the RHCP preserve system to the USFWS by December 1 of each year, as a part of the RHCP annual report (see Section 7.6).

6.4.5.1 Monitoring Populations of Covered Species

Monitoring studies for populations of the covered species will, at a minimum, provide information on the number of warbler and vireos utilizing the RHCP preserve system and identify areas of occupied and unoccupied habitat within the preserve system. These monitoring studies will also be used to track trends in population sizes and habitat use over time.

Territory Mapping Surveys

Preserve managers will estimate the number of warblers and vireos utilizing each preserve parcel and use this information to prepare or update the baseline preserve evaluation for that parcel. This information will be obtained via breeding season surveys completed at least once every five years, as described in Section 6.4.6, for the warbler and vireo using methods that are sufficient to estimate the number of individuals of each species utilizing each preserve parcel during the survey year.

The standard methods to be used for territory mapping surveys of the covered species are described below and are based on bird territory spot-mapping methods. The methodology is adapted from the November 2007 version of the USFWS minimum procedures for determining the presence/absence of golden-cheeked warblers and black-capped vireos, with additional guidance on data collection and territory interpretation provided by the International Bird Census Committee (1970) and Bibby et al. (2000). Alternate survey methods may be used provided that such methods are approved by Hays County and the USFWS in advance and are sufficient to achieve the survey purpose.

The standard methods to be used for territory mapping surveys for the covered species are described below:

1. All personnel conducing population surveys for the covered species will be covered by an USFWS Threatened and Endangered Species permit that authorizes the biologist to conduct surveys for the golden-cheeked warbler and black-capped vireo.
2. Surveys will be completed during the breeding seasons of the covered species, as follows:
    a. Survey season for the golden-cheeked warbler starts March 15 and ends May 15; and
    b. Survey season for the black-capped vireo starts April 10 and ends July 1. A minimum of 50 percent of the survey visits for the vireo will be completed between April 10 and May 31.

3. Survey visits may begin 30 minutes before sunrise and will end no later than eight hours after sunrise.

4. Surveys will include all areas of potential habitat for the covered species within a preserve parcel, including areas of potentially low quality or transitional habitat.

5. A complete survey will include at least five survey visits to each 100-acre unit of potential habitat within the preserve parcel, with each visit spaced at least five days apart.

6. Survey time for each visit will be at a rate of at least four hours for every 100 acres of potential habitat surveyed. A minimum of one hour of survey time per visit is required regardless of the number of acres surveyed. Therefore, the total survey time for a complete survey is at least 20 hours per 100 acres of potential habitat (with a minimum of five hours of total survey time for survey areas smaller than 25 acres).

7. Surveys will be conducted on days when weather conditions are suitable for the detection of the covered species. Surveys will not be conducted on days with moderate or heavy rainfall or when sustained winds exceed approximately 25 miles per hour.

8. Survey routes travelled during each visit will be designed to evenly cover the area of potential habitat for the covered species within a parcel (i.e., the survey area). The routes will be varied among visits to ensure that surveyors walk within 300 feet of all portions of the survey area at least once during the five survey visits. Starting and ending points and/or survey direction will also be varied for each survey visit.

9. Surveyors will quietly and slowly walk the survey route and record all detections of the covered species on field notes and maps (i.e., spot mapping observations). GPS receivers capable of at least three meter accuracy will be used to record the location of precise detections in the field.

10. Detections of the covered species will be recorded on detailed field maps and in field notes with standard mapping symbols as described in International Bird Census Committee (1970). Field maps will be at a scale of no more than 1 inch = 400 feet and will contain base information sufficient to identify the observer's location and the location of bird detections, such as aerial imagery and/or topography. New field maps will be used for each survey visit. Additional field notes will be recorded as described below to interpret results.

11. Information about each warbler or vireo detection will be recorded on field maps and/or in field notes, including:

a. Species (i.e., warbler or vireo), sex, and age (i.e., adult or juvenile);

b. Detection type: a precise vs. imprecise detection, a territorial vs. non-territorial detection (i.e., singing male vs. non-singing male), or an aggressive encounter between multiple birds;

c. Detection location precision (i.e., a standardized estimate of the precision of a detection location; for example, the true location of the bird is within 30, 60, 90, 120, 180, or 240+ feet of the recorded location);

d. Observations of movement for individual birds and observations of contemporary contacts between multiple birds; and

e. Other data, as applicable, such as observations of nests or behaviors.

12. Field data for bird detections will be entered into a GIS database (to include all GPS data and digitized versions of non-GPS data – including all point observations, precision buffers, and movement/contemporary lines). Data from individual surveys visits will be overlaid to interpret the results for a complete survey.

13. Bird detection data will be interpreted to estimate territory boundaries for individual warblers and vireos within or immediately adjacent to the preserve parcel, as described in Bibby et al. (2000). Approximate territory boundaries will be digitized and added to the GIS database of the survey results.

14. A report will be prepared for each survey documenting the results of the survey and estimating the number of warbler and vireos utilizing the preserve parcel. Reports will include the following information:

    a. A description of the survey area, including parcel name, location, ownership, total size, acres of potential habitat for each of the covered species (i.e., the size of the survey area), and a general description of habitat conditions;

    b. Conditions for each survey visit, including date, surveyor name, starting/ending times of survey visits, total survey time, and starting and ending weather conditions (i.e., temperature, wind speed and direction, cloud cover, and precipitation);

    c. A summary of survey results, including the number of bird detections, the estimated number of warbler and vireo territories completely within, partially within, and immediately adjacent to the survey area.

d. A set of maps showing: 1) the location of the parcel and the extent of potential habitat within the parcel; 2) the combined survey routes for the complete survey; and 3) the combined survey results for the complete survey including individual bird detections and approximate territory boundaries.

e. Digital copies of the survey report and the GIS database of survey results (including bird detections, approximate territory boundaries, parcel boundaries, and areas of potential habitat). All GIS data will be submitted in Texas State Plane Coordinates (South Central Zone), NAD83 datum, and map units of feet.

Preserve managers will submit survey reports to Hays County by October 31 of the year in which they were performed. Surveys not conducted in accordance with these standard methods (including the reporting requirements) may be rejected by Hays County and the USFWS for the purposes of meeting the requirements for management and monitoring of the RHCP preserve system.

Habitat Occupancy Surveys

Baseline preserve evaluations for preserve parcels require an estimate of the amount and location of occupied and unoccupied habitats within their boundaries, with respect to the covered species. Occupancy monitoring within the RHCP preserve system will use occupancy modeling methods, as generally described by MacKenzie et al. (2002), MacKenzie et al. (2006), Rhodes et al. (2006), and Royle and Nichols (2003). The purpose of these occupancy surveys is to determine species presence or non-presence in potential habitat within the preserves and to track changes in habitat use over time using a survey methodology that incorporates more statistical rigor than traditional spot-mapping methods.

Occupancy monitoring surveys will be conducted at least once every five years for each preserve parcel, as described in Section 6.4.6.

The standard methods to be used for habitat occupancy surveys of the covered species are described below. Alternate survey methods may be used provided that such methods are approved by Hays County and the USFWS in advance and are sufficient to achieve the survey purpose.

The standard methods for occupancy monitoring surveys for the covered species include the following:

1. All personnel conducing occupancy monitoring surveys for the covered species must be covered by an USFWS Threatened and Endangered Species permit that authorizes the biologist to conduct surveys for the golden-cheeked warbler and black-capped vireo.

2. Surveys will be completed during the breeding seasons of the covered species, as follows:

    a. Survey season for the golden-cheeked warbler starts March 15 and ends May 15; and

    b. Survey season for the black-capped vireo starts April 10 and ends July 1.

3. Separate surveys will be conducted for warblers and vireos when habitat for each occurs within the same preserve parcel.

4. Survey visits may begin 30 minutes before sunrise and will end no later than eight hours after sunrise.

5. Surveys will include all areas of potential habitat for the covered species within a preserve parcel, including areas of potentially low quality or transitional habitat.

6. At least ten survey stations per 100 acres of potential habitat will be established, with each station positioned within potential habitat for the survey species and at least 200 meters apart. Survey stations will be arranged in a regular grid and positioned no closer than 100 meters of a preserve parcel edge, to the extent practicable given the size and shape of the particular survey area. The locations of all survey stations will be recorded in the field with GPS receivers capable of at least three meter accuracy.

7. Each survey station will be visited up to five times during the survey season or until presence of the survey species is established during that year. There will be at least 24 hours between visits to a station and all visits to a station will be completed within 30 days of the first visit.

8. Surveys at each station will last up to five minutes per visit or until presence of the survey species is established during that visit.

9. The order in which survey stations are visited will be varied among survey visits.

10. Surveys will be conducted on days when weather conditions are suitable for the detection of the survey species. Surveys will not be conducted on days with moderate or heavy rainfall or when sustained winds exceed approximately 25 miles per hour.

11. Surveyors will denote presence or absence of the survey species at each survey station for each visit to that station. Once presence has been established at a survey station, additional visits to that station are not needed for that year's survey. Presence at a survey station will be established with a visual or auditory observation of the survey species from that station, regardless of the sex, age,

territorial behavior, precise location of the individual bird, or number of individuals of that species observed at that station.

12. Presence/non-presence data for the survey species will be analyzed with occupancy modeling software, such as the PRESENCE software program developed by Darryl MacKenzie of Proteus Research & Consulting Ltd. under contract to the U.S. Geological Survey, to estimate occupancy and detection probabilities (with standard errors) for the survey species.

13. A report will be prepared for each survey documenting the results of the survey and indicating areas of presence or non-presence of the survey species. Reports will include the following information:

    a. A description of the survey area, including parcel name, location, ownership, total size, acres of potential habitat for each of the covered species (i.e., the size of the survey area), and a general description of habitat conditions;

    b. Conditions for each survey visit, including date, surveyor name, starting/ending times of survey visits, total survey time, and starting and ending weather conditions (i.e., temperature, wind speed and direction, cloud cover, and precipitation);

    c. A matrix of detections for the survey species. Detection matrices will identify survey stations in rows and survey visits in columns, with a notation of absence, presence, or no visit for each cell in the matrix;

    d. A summary of survey results, including estimates (with standard errors) of occupancy and detection probabilities for each of the covered species. Methods or statistical models used to derive occupancy and detection probabilities will be identified and described;

    e. A map showing the location of the parcel, the extent of potential habitat within the parcel, and the location of survey stations classified by occupancy status; and

    f. Digital copies of the survey report and the GIS database of survey results (including survey stations classified by occupancy status, parcel boundaries, and areas of potential habitat). All GIS data will be submitted in Texas State Plane Coordinates (South Central Zone), NAD83 datum, and map units of feet.

Preserve managers will submit survey reports to Hays County by October 31 of the year in which they were performed. Surveys not conducted in accordance with these standard methods (including the reporting requirements) may be rejected by Hays County and the

USFWS for the purposes of meeting the requirements for management and monitoring of the RHCP preserve system.

6.4.5.2 Habitat Monitoring for the Covered Species

While regular habitat determinations (as described in Section 7.4.2) to identify the extent of potential habitat for the covered species in the preserve system are required as part of the regular baseline preserve evaluations, these assessments do not measure habitat variables or characteristics that might be important indicators of habitat suitability or quality. Monitoring habitat variables will allow Hays County and RHCP preserve managers identify and track potential changes in the suitability or quality of habitats for the covered species in the preserve system over time. The monitoring methods described in this section are intended to provide long-term data for identifying trends in the composition, structure, and general health of protected habitats for the covered species across the preserve system.

Consistent with habitat monitoring methods used for the Balcones Canyonlands Preserve in Travis County, habitat monitoring in the RHCP preserve system will be based on the Land Condition Trend Analysis (LCTA) process developed by the U.S. Army (see Tazik et al. 1992) to monitor changes in land conditions over time. For the purposes of the RHCP, a modified LCTA methodology will be used that focuses on the collection of data related to land use, surface disturbances, ground cover, canopy cover, species composition, and vegetation structure, as described below. Habitat monitoring surveys will be conducted at least once every five years, as described in Section 6.4.6.

The standard methods for habitat monitoring in the RHCP preserve system using modified LCTA methods for the covered species includes the following:

1. Long-term habitat monitoring plots will be permanently established throughout the preserve system within areas of potential habitat for the covered species.
2. At least one plot will be established for each 100 acres of potential habitat within the preserve system. At least one plot will be established within each preserve parcel.
3. The distribution of plots between areas of warbler and vireo habitat will be made in proportion to the total acreage of these habitats within the preserve system.
4. Plots will be 100 meters long and 6 meters wide, with a 100 meter line transect along the longitudinal axis of the plot.
5. Plots will be randomly located within areas of potential habitat for the covered species. The orientation of each plot will be determined randomly, so long as the plot remains within the area identified as potential habitat for the covered species. The starting point of the line transect for each plot will be recorded with a GPS receiver capable of at least three meter accuracy.

6. Plots will be monitored at least once every five years.

7. Monitoring will include the land use, line transect, and belt transect methods described in Tazik et al. (1992), which characterize land uses and maintenance activities, surface disturbances, ground cover, canopy cover, plant species composition, plant density, plant heights, and plant distributions in the plot. Photographs of each plot will also be taken from the starting point of the line transect.

8. A report will be prepared for each preserve parcel documenting the results of the habitat monitoring. Reports will include plot locations (including GPS coordinates and the orientation of the plot) and all data forms, spreadsheets, maps, sketches, and photographs from each plot.

Alternate habitat monitoring methods may be used provided that such methods are approved by Hays County and the USFWS in advance and are sufficient to achieve the survey purpose.

Preserve managers will submit habitat monitoring reports to Hays County by October 31 of the year in which they were performed. Surveys not conducted in accordance with these standard methods (including the reporting requirements) may be rejected by Hays County and the USFWS for the purposes of meeting the requirements for management and monitoring of the RHCP preserve system.

6.4.6 Schedule for Major Preserve Management and Monitoring Tasks

Each of the major preserve management and monitoring tasks described in Section 6.4 are required to be completed or updated once every five years. To simplify the scheduling and completion of these tasks, since preserve parcels will be acquired on a phased basis over the term of the permit, preserve managers will complete each type of major task across the entire preserve system (as it exists at the time) according to the following schedule:

- Years ending in 0 or 5: Territory Mapping Surveys;
- Years ending in 1 or 6: Habitat Occupancy Surveys;
- Years ending in 2 or 7: Habitat Monitoring Surveys;
- Years ending in 3 or 8: Baseline Preserve Evaluations; and
- Years ending in 4 or 9: Land Management Plans.

Interim surveys, evaluations, or land management plans may be prepared for preserve parcels that are acquired early in the five-year cycle.

6.4.7 Management of Public Access and Other Preserve Uses

Individual preserve parcels will include various types of habitat, and some may be more suitable than others for different levels of public access or non-habitat uses. Land management plans will specify which areas are managed primarily for habitat and which areas may be appropriate for public access or other uses. While the RHCP and Permit may permit certain types of public access and use of the preserve system with approval of the USFWS on a case-by-case basis, inclusion of land in the RHCP preserve system, either by fee simple acquisition by the County or via conservation easements (or other agreements) on land owned by other entities, does not require or imply that public access must be allowed. Public access to RHCP preserves, in accordance with the RHCP and Permit, is at the discretion of the parcel owner and must be approved by the USFWS.

Provisions for other uses of privately owned RHCP preserve parcels will be determined on a case-by-case basis by the specific terms of a conservation easement or similar agreement, as negotiated by the landowner, Hays County, and the USFWS. Access to the preserves by preserve managers in the performance of land management activities will be covered by the Permit.

6.4.7.1 Public Access within the RHCP Preserve System

All public access to RHCP preserve parcels will be in accordance with the terms of the Permit and the provisions stated below. Public access to RHCP preserves may be permitted, but not required or mandated under this RHCP, with USFWS approval on a case-by-case basis. Preserve owners may allow public access only if allowed by the permit, this RHCP, and the land management plan approved by the USFWS. 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 public access 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 public access is defined as human foot traffic on approved trails or other defined areas outside of the breeding seasons for the covered species. For the purpose of these public access criteria, the breeding season of the golden-cheeked warbler is defined as March 1 through July 31 (see Section 3.2.1.1) and the breeding season of the black-capped vireo is defined as March 15 through August 31 (see Section 3.2.2.1). 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 USFWS.

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 will be approved by the USFWS. Active (as opposed to passive) 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 occur on lands protected pursuant to this RHCP. 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. Any potential mitigation needs for the direct and indirect effects of active use areas in potential habitat may be addressed in accordance with the RHCP participation process described in Section 7.4.

In all cases, at least one territory survey, one habitat occupancy survey, and one habitat monitoring survey will be completed within the RHCP preserve parcel prior to allowing any type of public access within that parcel. 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.

6.4.7.2 Infrastructure Management on Preserve Lands

Lands added to the preserve system, whether by fee simple acquisition or conservation easement, may include existing infrastructure facilities. In addition, it may be necessary for certain infrastructure to be placed within the preserve system in the future. Many types of infrastructure facilities may exist within the preserve lands, including electric transmission and distribution lines and substations, water lines, wastewater lines, gas and petroleum pipelines, and public roads. Some infrastructure facilities may be above ground (e.g., most electric facilities), while others may be below ground (e.g., water, wastewater, gas, and petroleum lines). This

section provides the requirements and recommendations for the infrastructure management needed to provide reliable service and to reduce impacts to, and as appropriate, mitigate for the covered species and their habitat.

Existing Infrastructure within Preserve Lands

The owners and managers of infrastructure facilities and easements in the preserve system will utilize best management practices, to the extent feasible and as appropriate for each specific industry (i.e., electricity providers, water service providers, etc.) to minimize, and as appropriate, mitigate for the adverse environmental effects of the operation and maintenance (O&M) of such facilities.

For utility service providers with existing facilities within the RHCP preserves whose O&M activities will take covered species, the County will request that the utility service provider obtain incidental take authorization for the take associated with such activities, which could include participation in the RHCP. Hays County will require utility service providers with infrastructure facilities within the preserve system that seek incidental take coverage through the RHCP to prepare O&M plans and submit them to the County for review and approval in order to receive the benefit of Permit coverage for their activities. The O&M plan will include a description of the facilities, planned/scheduled maintenance procedures, a schedule for implementation of routine management practices (with a preference for conducting such activities outside of the breeding seasons of the covered species), natural resource management considerations (including habitats for the covered species and other resources, such as soils and waters), and emergency maintenance procedures. The County's review and approval of utility infrastructure O&M plans shall not be unreasonably withheld or delayed.

Preserve management plans prepared by the County and managing partners will map and describe utilities and infrastructure within each preserve parcel.

New Infrastructure Corridors

No new infrastructure corridors will be allowed within RHCP preserves except as authorized on a case-by-case basis at the discretion the County with the approval of the USFWS. In such cases, applications to the RHCP for mitigation assessments for new facilities will include a description of the design, temporary and permanent construction easements, erosion and sedimentation control plans (temporary and permanent), restoration plans, draft operation and maintenance plan, and a summary of routing alternatives.

New facilities will avoid crossing preserve lands and will minimize impacts to covered species to the extent feasible. New infrastructure rights-of-way that cannot feasibly avoid crossing preserve lands should be placed within or parallel to existing easements whenever feasible. New infrastructure easements will be assessed for direct and indirect habitat impacts

outside of preserve lands and within preserve lands. Mitigation assessments within preserve lands will be assessed at a level that is at least double the cost of mitigation required outside preserve lands, to compensate for any lost mitigation within the preserve.

6.5 Adaptive Management Provisions

Adaptive management, as described by the USFWS in the Five-point Policy Initiative addendum to the HCP Handbook (65 FR 35242), is an integrated method for addressing uncertainty in the conservation of species covered by a habitat conservation plan. The purpose of adaptive management is to streamline and improve the decision-making process for the conservation program. The RHCP adaptive management provisions are consistent with the guidance provided by the HCP Handbook (USFWS and NMFS 1996).

The USFWS's framework for addressing adaptive management in habitat conservation plans 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 experimental strategies to implement; 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 RHCP management and monitoring program described in Section 6.4 includes cycles of regular review and revision of baseline assessments, management plans, and monitoring data to adapt to new conditions or incorporate new information. These built-in adaptive strategies address uncertainty regarding effective habitat management practices for the covered species and public access or use issues.

6.5.1 Uncertainty in the Effectiveness of the Preserve Design Criteria

The conservation program identifies the typical design criteria for preserve blocks that will have mitigation value under the RHCP. The design criteria require that individual preserve blocks must typically include at least 500 total acres. Arnold (1996) and Butcher (2008) have shown that golden-cheeked warblers successfully reproduce in patches of habitat as small as approximately 37 acres to 57 acres. The design criteria for RHCP preserves requires that individual preserve blocks include five to eight times this minimum acreage of potential habitat. The preserve design criteria do not require specific preserve parcel or habitat patch configurations for the preserve system.

While the preserve design criteria currently appear to substantially exceed the minimum patch size threshold for warbler reproduction, Coldren (1998) points out that the internal ecosystem processes within a patch of habitat are influenced by the types of land uses adjacent to and in the vicinity of the patch. Habitat patches of similar size and vegetation characteristics may not be ecologically equivalent due to differences in their surroundings. Golden-cheeked

warbler occupancy of habitat patches was shown to be positively associated with adjacent agricultural and grassland uses, but negatively associated with nearby residential or commercial uses (Arnold 1996, Coldren 1998). Therefore, while the minimum patch size for successful warbler reproduction in a largely rural or agricultural landscape may be approximately 37 to 57 acres, the minimum successful patch size in a largely urban or developed landscape may be much larger.

6.5.2 Strategies for Dealing with Uncertainty in the Preserve Design Criteria

The RHCP conservation program is currently thought to be conservative with respect to uncertainty regarding the preserve design criteria. The preserve design criteria are many times larger than the best available estimates of the minimum patch size needed to sustain golden-cheeked warbler reproduction. This safeguard and the requisite approval from the USFWS prior to an acquisition generating mitigation credits are the primary strategy for dealing with uncertainty in the preserve design criteria.

Alternatively, if (due to increases in adjacent or nearby developed land uses) monitoring shows that RHCP preserves blocks are not large enough or do not contain sufficiently large habitat patches to support occupancy by the covered species such that the conservation value of the preserves has been reduced, Hays County will negotiate with the USFWS to amend the RHCP and Permit to increase the standards for the preserve design criteria that would be applied to subsequent preserve acquisitions. The County will also work with the USFWS to modify preserve management practices, within the limits of existing preserve management budgets and contingency funds, as appropriate to help prevent, reduce, or reverse the loss of conservation value on existing preserve blocks.

6.5.3 Monitoring to Assess the Effectiveness of the Preserve Design Criteria

The management and monitoring program described in Section 6.4 requires a detailed baseline assessment of each preserve parcel, including regular monitoring of populations and habitats of the covered species. The management and monitoring program will provide sufficient data to evaluate whether potential habitat within the preserves is used by the covered species.

6.5.4 Process for Revising Preserve Design Criteria

Hays County and the USFWS will review the data from the baseline evaluations and monitoring surveys to determine if the RHCP preserve system is providing adequate mitigation to balance the impacts of incidental take authorized by the permit. If the monitoring surveys show that a preserve block that is completely or substantially surrounded by development has not been occupied by the warbler for five consecutive years, the USFWS may require Hays County to amend the preserve design criteria to be applied to subsequent preserve acquisitions or to modify management practices within existing preserves, as described in Section 6.5.2.

Similarly, if the monitoring surveys show that a preserve block with a designated vireo management area has not been occupied by the species for ten consecutive years, the USFWS may require Hays County to amend the preserve design criteria to be applied to subsequent preserve acquisitions, as described in Section 6.5.2.

6.6 Voluntary Conservation Measures for Evaluation Species

In order to generate additional information about the evaluation species and their habitats, the County will spend $25,000 per year for first ten years of the RHCP on research or studies of one or more of these species. The County will coordinate the use of these funds with USFWS.

Hays County will also commit to working with the USFWS, as opportunities may arise during the duration of the RHCP, on regional solutions to the conservation of karst and karst-aquatic species, including the evaluation and additional species addressed in the RHCP. This commitment may involve participation in regional workgroups or similar efforts to develop strategies to conserve these species and their habitats, or implementation of measures or programs within the County's regulatory authority to further the conservation of these species.

studies on one or more of the karst evaluation species addressed in the RHCP or their habitats. The County will commit to provide $25,000 per year (in 2009 dollars) for the first ten years of the RHCP to fund such research, as described in Section 6.6. The purpose of the funding is to develop information that the County may use to help evaluate whether and/or how to address such species in the RHCP should one or more become federally listed in the future.

Hays County will develop a process for soliciting and evaluating annual requests for proposals on karst evaluation species and habitats in Hays County during the first year of the RHCP. The proposals will be evaluated with respect to the research priorities described in Section 6.6, and the County will confer with the USFWS on selecting specific research projects chosen for funding through the RHCP.

7.6 Compliance Monitoring and Reporting

Hays County will submit an annual report to the local and regional offices of the USFWS by December 1 of each year to document progress towards achieving the goals and objectives of the RHCP and demonstrate compliance with the terms and conditions of the Permit.

The report will cover the period of October 1 through September 31, which coincides with the County's fiscal year. The due date will provide ample time to collect, review, and summarize data related to RHCP administration and preserve management and monitoring. The report will be prepared by Hays County RHCP staff, with the assistance of those entities with management and monitoring responsibilities under the RHCP.

Specifically, annual reports will include:

- A summary of current participation in the RHCP, including the number of participants and a list of properties and acreages covered for incidental take;
- A summary of the lands and habitat included in the RHCP preserve system, including total acres and acres of habitat protected and managed within County-owned preserves, managing partner preserves, and RHCP conservation easements;
- A summary of the number of mitigation credits generated by RHCP preserve system acquisitions and debited through sale to RHCP participants or used by Hays County (i.e., the conservation bank ledger);
- A summary of the financial status of the RHCP, including administrative and management costs and revenues generated for the RHCP;
- A summary of management activities conducted on RHCP preserve lands for covered species;
- The results of biological monitoring activities conducted on RHCP preserve lands, including all reports documenting surveys of the covered species and their habitats;

- A summary of the status of community education and outreach programs and voluntary conservation measures for the evaluation and additional species, including the results of any research conducted through the RHCP;
- Recommended modifications to the conservation program or preserve management plans via the adaptive management process;
- Any compliance-related issues and actions involving individual participants of the RHCP; and
- Other pertinent information or recommendations, as appropriate.

The USFWS will review the annual reports and determine whether Hays County is in compliance with the terms of the RHCP, the Permit, and other applicable agreements. The USFWS may request additional information from Hays County to determine if the County is in compliance with the terms and conditions of the Permit.

7.7 Permit Amendment Process

Amendments to the RHCP and/or the Permit may be necessary during the term of the Permit. These amendments may include relatively minor changes to the RHCP and/or Permit, or major changes that substantially alter the covered activities, mitigation provided by the conservation program, or other substantive aspects of RHCP implementation. Amendments to the RHCP and Permit will be made in accordance with applicable law and regulations.

Minor amendments are defined as those that have little or no impact on the amount of incidental take authorized by the Permit, the degree of negative impacts to the covered species from covered activities, or the biological effectiveness of the conservation program. Minor amendments may include, but are not limited to:

- Administrative changes addressing the implementation of the RHCP, such as staff duties, participation procedures, fee structures, reporting requirements, and oversight;
- Minor modifications to management or monitoring methods; and
- Similarly minor alterations to the RHCP and/or incidental take permit that could arise from changed or unforeseen circumstances, adaptive management provisions, or other circumstances.

Minor amendments may be incorporated into the RHCP and/or incidental take permit administratively provided that both the County and the USFWS agree on the proposed changes, the proposed amendments are documented in written form, and the proposed amendments do not significantly change the net effect of the covered activities on the species or the amount of incidental take requested by the original plan and incidental take permit.

CHAPTER 7 – MONITORING AND REPORTING

7.1 INTRODUCTION

Monitoring and reporting are required by the Service to ensure compliance with the terms of the incidental take 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 of incidental take of habitat that has occurred under the RHCP, an assessment of the status of the species and their habitat, and any data necessary for adaptive management purposes. The County, through its implementing agent (the Williamson County Conservation Foundation), will use the results of the monitoring efforts to assess management strategies and develop more effective alternatives, as necessary, through the adaptive management procedures.

7.2 BIOLOGICAL AND COMPLIANCE MONITORING

Biological monitoring will primarily focus on the covered karst invertebrate species in up to 15 separate KFAs (both enhanced existing karst conservation areas and new KFAs established under the RHCP) and on the Georgetown salamander (see Chapter 5, Sections 5.6.1.1 and 5.7). Since take for golden-cheeked warblers will be initially mitigated with Hickory Pass Ranch mitigation credits, monitoring of that site is the responsibility of the mitigation bank and included in the mitigation credit fees. Until such time the need for mitigation above that provided by the Hickory Pass Ranch mitigation credits has been demonstrated and the County establishes one or more within-county mitigation banks for golden-cheeked warblers, no endangered bird monitoring will be done through the RHCP. If such a mitigation bank (or banks) is established a management and monitoring plan will be prepared by the Foundation and approved by the Service.[92] All management and monitoring plans will be completed within one year from when the mitigation land is purchased and the bank established.

The karst invertebrate and salamander monitoring efforts are designed to provide data on the relative abundance, distribution, and habitat condition of these endangered and rare species, as well as to provide annual information that can be used in the Adaptive Management process (see Appendix B and Chapter 8). Multiple years of data will provide further information on abundance, species distribution, response to changing habitat conditions, and appropriate management activities, particularly for species that have been the subject of limited scientific research, such as the endangered karst invertebrates and Georgetown salamander. All biological monitoring data collected by this RHCP will be available to the public for review and further analysis.

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[92] The County recently purchased the 145-acre Whitney Tract to be incorporated into the RHCP as a preserve for the golden-cheeked warbler and other species. Of the 145 acres, 115.52 acres will be available as warbler mitigation credits. The County has agreed to assume the monitoring responsibilities required for that property by a previous HCP (the Russell Park Estates HCP; see USFWS 2002).

An annual report summarizing the results of the biological monitoring and adaptive management process and findings will be prepared and submitted to the Service on January 1 of each calendar year. This required information includes 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. 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.

In addition to those biological elements described in Chapter 8 (see Section 8.4), the annual report will also include a summary of the participation and funding status of the RHCP. Information provided will include the number of participants, number of acres of impacts to potential habitat, number of acres of potential habitat preserved, annual income and expenses of the Foundation, and any other information relevant to the implementation of the RHCP.

CHAPTER 8 – ADAPTIVE MANAGEMENT

8.1 INTRODUCTION

Evaluating the effectiveness of mitigation will be closely tied to the adaptive management and monitoring components of the RHCP. Adaptive management is an iterative 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 identify alternate hypotheses; and
- designing policies to provide continued resource productivity and opportunities for learning.

Little scientific information is available on the central Texas karst invertebrate species, their management needs, and especially the relationship between land use and take as defined in the Endangered Species Act; thus, adaptive management has immediate relevance for this RHCP. For example, questions that could be the ongoing focus of RHCP-sponsored research include the following: "How much active management do cave preserves need?" and "How much and what kind of red imported fire ant control is necessary?"

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.

8.2 ADAPTIVE MANAGEMENT WORK GROUP

To effect an efficient and effective adaptive management process for the RHCP, the Foundation 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 Williamson County government, the RHCP citizens advisory committee, the RHCP biological advisory committee, and the scientific community. This group will review the annual report and make recommendations for 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, disbursement of mitigation funds (e.g., land acquisition purchases, black-capped vireo restoration/enhancement efforts, etc.), and the effectiveness of the Foundation at achieving RHCP goals. The Adaptive Management Work Group will meet at least twice a year, once to review the Foundation's annual report to the Service, and once to review, approve and/or recommend modifications to the annual operating/financial plan.

8.3 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 experimental strategies to implement; 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.*

   One of the greatest existing uncertainties relating to the long-term conservation of the karst invertebrates is the question of exactly how much of an area in acres and what topographic parameters should the aboveground preserve (KFA) include. General guidelines for karst preserve size and configuration are summarized in Chapters 3 and 4, but the specifics of each KFA established must be done on a case-by-case basis. Scientific data on the efficacy of existing conservation areas and the relationship between preserve size and adequacy of species protection will improve through time, and it is essential that new information be incorporated into RHCP management on a timely basis. 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 indicate changes in management are needed is a key element of the adaptive management process. Several potential threats to the karst invertebrates and salamanders have been identified in Chapter 3, and it is important that the Foundation be capable of precisely identifying what adaptive management actions will occur if any of these threats increase. For example, if there is an increase in red imported fire ants, then control and treatment efforts would increase a specific number of times per year. Any changes in treatment for fire ants would then be linked back to the monitoring program to ensure fire ant densities do not exceed a certain threshold level. If thresholds are exceeded, or if through additional research it is determined a lower density is needed, additional adaptive management actions would occur and treatments would change accordingly (see Appendix B for monitoring plan details).

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

   A monitoring program where both aboveground and belowground preserve habitats are regularly and consistently monitored is an important element to the management of preserve resources. Guidelines for an RHCP karst monitoring program are presented in Appendix B; site-specific monitoring plans will be developed and implemented for each KFA, for the Georgetown salamander, and for the golden-cheeked warbler if and when an in-county conservation bank for that species is established. Foundation-supported monitoring may also be appropriate as part of habitat restoration/enhancement activities for the black-capped 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 10, 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 each year. 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 an amendment(s) to the RHCP.

8.4 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 additional species.

- Because all karst species participants will be required to conduct full Geological Assessments and presence/absence surveys of detected features with potential habitat for listed karst species, the participation process is anticipated to generate knowledge of new locations of both covered and additional species. This new information will be included in a database that will be developed and maintained by the Foundation for all covered and additional species included in this RHCP. The database will include the known locations and general population numbers and/or karst survey specimen collection records, and preserve (karst, warbler, vireo) habitat quality indices (e.g., cave humidity and temperature, vandalism) collected during monitoring efforts. To the fullest extent allowed by state law, the Foundation will attempt to maintain the confidentiality of the database.

- Every year as a component of the RHCP annual report, the RHCP administrator will evaluate the increase or decrease in known locations of all species as well as preserve habitat quality improvement or deterioration. 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 initiate a literature and research update on each of the 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.
- If new information is available on a species, the County will coordinate a species status assessment, with input from the Service, TPWD, and other qualified experts.
- Following the assessment, 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 the evaluation of RHCP benefits, the County will determine the levels of expected impact and existing protected areas for the additional species and decide whether to seek coverage of the species under the RHCP, in which case it will apply for any appropriate amendments to the RHCP.
- As not enough information on the additional species is currently available to adequately determine impacts or benefits, it is not possible or appropriate for the Service to determine if implementation of this RHCP would jeopardize the continued existence of one of these species. As the information identified above becomes available, or one or more of the additional species becomes listed and coverage is desired, at a minimum the Service and the County will need to amend the RHCP, the Permit, and the Biological Opinion to allow for inclusion on the Permit.

BALCONES CANYONLANDS PRESERVE
LAND MANAGEMENT PLAN

TIER II A

CHAPTER 1
LAND MANAGEMENT PLANS AND GUIDELINES

Document reprinted from:

U. S. Fish and Wildlife Service. 1996. Final Environmental Impact Statement/Habitat Conservation Plan for Proposed Issuance of a Permit to Allow Incidental Take of the Golden-cheeked Warbler, Black-capped Vireo, and Six Karst Invertebrates in Travis County, Texas. U. S. Fish and Wildlife Service, Albuquerque, N. M.

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1.0 LAND MANAGEMENT PLANS AND GUIDELINES

The BCCP preserve system is to be managed to permanently conserve and facilitate the recovery of the populations of target endangered species inhabiting western Travis County. This priority objective will govern preserve management activities to improve target species habitat, while protecting preserves against degradation caused by urbanization of surrounding lands and increased public demand for recreation usage within preserves.

The welfare of target species (species of concern) will be the overriding influence on all decisions regarding activities on preserve lands. Decisions about activities within preserves should be made cautiously, so as to meet biological objectives to protect and enhance target species and minimize risk of damage to their habitat.

2.0 LAND MANAGEMENT PLANS

Because individual tracts will have varying types of habitat and may offer varying degrees of public access, each preserve manager will be required to obtain Coordinating Committee Secretary approval of a land management plan for each tract within one year after issuance of the Permit, or within one year after land acquisition, whichever is later.

2.1 Tract Land Management Plans

A tract Land Management Plan will describe both short-term and long-term management objectives and will serve as the primary document for reference and justification for all operations on that preserve. Each plan will identify major operational needs, issues, problems, and strategies, with sufficient information to serve as a complete guidance document. The plan should be written to cover a period of five years, but revisions to the Plan during these five years can be made as appropriate. Management plans for existing parks and preserves which will be included in the BCCP preserve system will need to conform with BCCP management guidelines, goals and policies. Management plans for contiguous or adjacent tracts will be reviewed for compatibility with one another. If such tracts are operated by different managing partners, the land management plans for each tract should be coordinated with the respective preserve managers.

Management Plans will contain the following information: (1) tract descriptions, (2) a management program, and (3) a system for monitoring management activities.

The Tract Descriptions section will provide the location of the tract with acreages and a graphical representation of the tract boundaries. It will also include descriptive information (historical, archeological, administrative, legal, financial, social, physical, ecological) and any other relevant information affecting the preserve to provide the basis for successful and efficient management of the preserve.

The Management Program section will identify any specific goals for the tract and will set priorities based on these goals. It will discuss all current and proposed future activities for the tract and give an analysis of the impact of these activities on the tract and on the endangered species and species of concern located on the tract. No activity will be allowed which results in a "take" of an endangered species, or which degrades or in any way harms the preserve. The management activities will be designed so that observation and monitoring efforts can be used to increase the efficiency of future management activities. The Management Program will also identify the resources that will be needed for these activities.

When writing land management plans, consideration should be given to restoration and enhancement of endangered species habitat, including vegetation restoration and control of browsing pressure. Consideration should also be given to management and control of fire ants, oak wilt, cowbirds, nest predators, and other problem species, if they occur on the tract. Each tract should have a fire management plan, including sufficient details to guide decisions on whether to suppress or allow natural fires and/or controlled burns. A multiple-use management approach may be appropriate on some tracts, whereby other uses may be compatible with the primary habitat protection and species management goals, as long as these uses either benefit or have no negative effects on the species of concern and do not significantly compete with other management efforts for personnel or financial resources. Examples of such uses which may be compatible under certain circumstances include recreation, environmental education, scientific uses, watershed protection, and non-endangered wildlife species management.

Since portions of each preserve component may be uninhabited, continually inhabited, or only seasonally inhabited by target species, specific access and management prescriptions may vary within each preserve and may include a variety of access options: year-round unrestricted access; year-round restricted access; or seasonally restricted access. Despite the potential for variability in individual management plans for preserve components, the design and implementation of land management plans must follow the guidelines set forth in the following section. In particular, habitat for target species in

BCCP preserves should be managed for existing and expanding populations and for re-colonization when local populations decline or are extirpated.

The Management Monitoring section will state what process will be used to monitor and evaluate the progress of management on the preserves and the effects of the management program on the species of concern and their habitats. This evaluation and monitoring will form the basis for management plan revisions.

2.2 Interim Land Management Responsibilities

Prior to the submittal to the Coordinating Committing Secretary of a land management plan for a specific tract, the preserve land will be managed per the Land Management Guidelines in the following section. Issues that each managing partner must address during this interim period are controlling access, protecting habitats, law enforcement, and fire control.

2.3 Annual Reports

Overall land management activities will be reviewed annually by the Coordinating Committee Secretary. To facilitate this process, preserve managers must submit annual reports to the Coordinating Committee Secretary, documenting compliance with individual land management plans and summarizing any monitoring efforts. Managing partners shall provide reasonable access to preserve system lands to Coordinating Committee representatives and preserve land managers for inspection, monitoring, or other functions consistent with preserve system goals.

3.0 LAND MANAGEMENT GUIDELINES

The following land management guidelines, a modification of TPWD draft 1993 Balcones Canyonlands Conservation Plan: Management Standards and Guidelines, attempt to achieve the biological objectives of the Permit by means of relatively standard land-use methodologies in coordination with monitoring programs (TPWD 1993). They generally adhere to the recommendations of the Biological Advisory Teams report (1990) with regard to suitable protective measures and compatible recreational uses of preserve lands. As other land management practices become available, they may be incorporated into the land management guidelines as appropriate.

Long-term monitoring of both the environmental quality of the preserve and the health of its populations of endangered species is a necessary part of this endeavor. This is primarily because the basic biology of most local federally listed species is not

sufficiently well understood to allow prediction of the impact on those species of specific management activities or use-intensity levels for public recreation. Consequently, management practices should be prescribed and monitored with an appropriate multi-species emphasis and overall ecosystem approach.

In accordance with the habitat preserve objectives, the following land management guidelines have been prepared for on-site vegetation management alternatives, management browsing pressure, control of public access, problem animal control, management of springs and associated watercourses, research and monitoring, and species-specific management.

3.1 Vegetation Management

Each of the following techniques may be used only in accordance with individual land management plans approved by the Coordinating Committee and USFWS.

3.2 Prescribed Fire

This practice is likely to be an effective tool for creation or maintenance of black-capped vireo habitat. Since uncontrolled hot fires have the capacity to destroy golden-cheeked warbler habitat and sensitive plant areas, use of prescribed burns should be undertaken with proper caution. The proposed location of fire lanes should not increase internal woodland edges or fragment woodland communities in golden-cheeked warbler habitat. A fire lane construction in occupied habitat should not be constructed during the season that migratory birds are in residence.

3.3 Mechanical Control

If mowing of grassed areas is necessary (i.e., for control of fires), tired tractors with shredders are permitted. Brush cutting with hand tools or with push brush-hogs is also permitted. Heavy equipment techniques such as chaining, grubbing, root plowing, blading, and hydro-axing have a greater potential for long-term soil erosion damage. Unless specifically authorized by the Coordinating Committee Secretary as part of a site-specific land management plan, including individual projects, the practice of vegetation removal by heavy equipment is prohibited.

3.4 Chemical Control

Applications of herbicides for specific purposes such as control of stands of exotic, invasive, or nuisance plants, and vegetation management at human access points may be permitted, upon review by the Coordinating Committee Secretary. All applications of

chemical herbicides must be performed by licensed applicators. Documentation of all applications must be kept on file by the preserve manager and made available to the Coordinating Committee Secretary upon request.

3.5 Grazing

Grazing, when approved by both the Coordinating Committee Secretary and the USFWS, may be employed on preserve lands as a limited vegetation management tool. Use of cattle grazing will be restricted to locales where other practices are difficult or impossible to use. If used, grazing intensity must not lead to degradation of water quality or increased cowbird populations. A cowbird-trapping program should be considered whenever livestock grazing as a management practice is employed.

3.6 Control of Oak-Wilt

Treatment of oak wilt is encouraged and should follow oak-wilt guidelines as established by the Texas Forest Service Oak Wilt Suppression Project, and must be approved by both the Coordinating Committee Secretary and the USFWS.

3.7 Management of Browsing Pressure

Browsers are herbivorous animals, such as native/feral/exotic deer, goats, and sheep, and sometimes cattle, which forage on understory plant growth (i.e., forbs and deciduous and evergreen trees and shrubs).

3.8 Fenced Enclosures to Exclude Browsers

Sensitive plant sites may be protected from excessive plant loss through over-browsing by placement of effective fenced enclosures that keep browsing animals out.

3.9 Browsing Animal Populations

In some cases, over-browsing may suppress the abundance and distribution of tree and shrub species in plant communities preferred by golden-cheeked warblers and black-capped vireos. Management of browsing pressure within these vegetation communities is a complex task that may require perimeter fencing of preserve tracts (when possible), long-term monitoring, hunting programs and intensive control efforts of browsing-animal populations. Browsing-animal control efforts should be instituted when declines in important vegetation components have been documented at a particular site. Appropriate deer population objectives should be set after consideration of deer and vegetation data from each site. Introduction of browsing animals must be approved by the USFWS.

3.9.1 Indirect Control

Practices designed to increase deer populations are prohibited. This refers to manipulation of vegetation, placement and maintenance of mineral blocks, or establishment of supplemental animal feeding areas. Restrictions on placement of deer feeding stations may be relaxed if such stations are essential for approved population control programs.

3.9.2 Direct Control

Approved deer control efforts should be designed to remove unnecessary animals as quickly, safely, and humanely as possible. Because most preserve tracts will become increasingly surrounded by suburban developments and experience higher recreational use, application of the latest non-lethal population control technologies may be considered.

3.10 Public Access

The preserve system may offer public access and recreational opportunities within the Austin and Travis County area where possible and manageable. Public access may be allowed where and when such access does not threaten the welfare of the target species of concern, which is the overriding goal of the preserve system, nor cause the degradation of soil, vegetation, or water resources.

The key to allowing public access that is non-threatening and non-damaging to preserve lands is implementation of effective management strategies to control such access and use. These management strategies must be specified in the individual land management plans and implemented by the preserve tract managers. Demonstration over time of effectively implemented management strategies on a preserve tract may justify increased public access opportunities. Demonstrated non-effectiveness or habitat degradation may justify less public access for a particular tract.

Effective management strategies can be any combination of, but are not limited to: fencing; signage; seasonally-restricted access; selected access to non-habitat areas of a tract only; careful trail and amenities location, design and relocation; ranger patrols and enforcement; or prohibited access to selected sensitive areas of a tract. Preserve managers are encouraged to consider creative plans that could increase public education and recreational opportunities while ensuring the welfare of the target species of concern.

Access to specific sites during specific seasons will be regulated to conserve target species and their associated communities. Creation of new roadways, trails, and cleared right-of-ways that open the canopies of woodland and shrubland communities, create additional impervious cover, or facilitate public use of preserve interiors or high quality sites occupied by target species should be discouraged. Access routes for preserve operation and maintenance can be rerouted if in an approved land management plan.

3.10.1 Basic Preserve Access Control

Provisions for adequate fencing and signage on all preserve components shall be undertaken by BCCP land managers. As preserve lands are acquired, upgrading of fencing along perimeter boundaries should be undertaken as soon as practical to achieve human access control. Interior fencing, if appropriate, should be established as a lower priority. Posting of signs should also be undertaken as soon as practical to identify the land as a preserve component or to prevent unauthorized use. These signs should be placed along perimeter fences, gates and other access points, and long trails and roads.

3.10.2 Individual or Independent Group Use

It is necessary to avoid, detect, and reduce the types of localized detrimental impacts associated with human activity on the preserves. The following types of outdoor activities may be allowed if they do not conflict with conservation of target species as described in the individual preserve land management plans.

3.10.3 Walking/Jogging/Hiking

Unsupervised group access should not be allowed within 100 meters of occupied songbird habitat during the breeding/nesting season, unless such access can be documented to show no apparent degradation to the welfare of the species of concern. Relatively extensive trail networks along existing right-of-ways may have to be maintained and monitored if this activity is approved. Creation of new trails will be addressed in preserve land management plans and should leave woodland canopies intact. In golden-cheeked warbler habitat, new trails should not fragment woodland interiors or allow human use intensity that threatens this species.

3.10.4 Fishing

Fishing may be allowed where there is existing access to lake frontage that is not inhabited by target species. If allowed, fishing locations will be designated and fishing will not be allowed outside designated areas. Fishing in environmentally-sensitive springs and deeper spring runs, especially where rare salamander species are present, will

be prohibited. Construction of new roads, access points and other support facilities for fishing must be approved in the preserve land management plans. Stocking of native or exotic species is prohibited unless specified in an approved land management plan.

3.10.5 Swimming/Boating/Rafting/Tubing

Designated water access areas may be available at selected locations, based on approved land management plans. Bank access restrictions may be necessary to protect adjacent target species habitats.

3.10.6 Bicycling

This activity is prohibited, except for selected sites designated as experimental sites, with appropriate monitoring for effects on the preserve and enforcement of all applicable rules. As part of an approved plan, creation of new trails should leave woodland canopies intact. In golden-cheeked warbler habitat, trails cannot fragment woodland interiors or allow human use intensity that threatens this species. Any new bicycle trails should be designed to minimize erosion, and existing approved trails exhibiting significant erosion should be closed and repaired. Any existing trails not approved by the Coordinating Committee Secretary will be closed.

3.10.7 Horseback Riding

This activity is prohibited, except for selected sites designated as experimental sites, with appropriate monitoring for effects on the preserve and enforcement of all applicable rules. Stables and similar facilities for the long-term (overnight or longer) maintenance of groups of horses shall not be constructed within any part of the preserve system. Contracts with private and commercial facilities on adjacent lands may be negotiated for use of tracts during the non-nesting and breeding season, provided that mitigation, clean up, and cowbird trapping are implemented. However, horses may be used for appropriate preserve O&M activities.

3.10.8 Off-Road Vehicle (ORV) Riding

This is prohibited as a recreational activity because it is not compatible with preserve management objectives and goals. Furthermore, appropriate barriers and enforcement penalties should be established to minimize trespass into preserve properties and subsequent damage by ORV users. However, these vehicles may be used for appropriate preserve O&M activities.

3.10.9 Picnicking

This activity will require provision of trash receptacles and restroom facilities at staging areas located near the periphery of tracts. If preserve managers wish to allow this activity, preserve land management plans will designate picnic sites that can be easily maintained, to avoid creating focal centers for cowbird feeding activity.

3.10.10 Camping

This activity is allowed only in designated areas and if related to O&M or guided educational activities. When allowed, camping should be restricted to minimum-impact camping. Preserve managers will designate suitable camping areas, and these minimum-impact camping areas should be rotated frequently to enable each site to recover from past use. Only closed-burning fires (such as camp stoves) will be allowed.

3.10.11 Nature Viewing

Some examples of permitted nature viewing opportunities are designated viewing areas with blinds, trails with descriptive trail brochures, or guided tours. Educational tours should be encouraged but procedures for review of tour group activities will be established in land management plans, as discussed below. Attempts to artificially improve wildlife viewing by maintenance of supplemental feeding areas are prohibited.

3.10.12 Spelunking

All access to caves must be restricted to permits issued by the appropriate land management agency, based on an appropriate program in the land management plan for the preservation of the cave ecosystem.

3.10.13 Rock Climbing

Rock climbing and related activities are prohibited, except for selected sites designated as experimental sites, with appropriate monitoring for effects on the preserve and enforcement of all applicable rules.

3.11 Non-Commercial Group Use

Non-commercial groups are nonprofit organizations, schools, and educational groups that request visitation to any tract for educational purposes or research. This use should be encouraged as long as it is monitored for possible habitat degradation and adverse impacts. These groups will be issued permits by the appropriate land management agency. The permit process should include user guidelines that protect target species and their respective habitats.

3.12 Educational Uses

Educational use is defined as those activities whose primary intent is to present or interpret information about the ecology of the preserve sites or the target species. Daytime field trips by school groups are typical of this public-use category.

3.13 Research Uses

Research use activities include those activities that will gather and interpret site-specific data in a way that improves understanding of the ecology of preserve species, plant communities, and aquatic and subterranean environments. Such activities will be coordinated through the appropriate preserve land manager.

3.14 Commercial Use

3.14.1 Guided Tours

Commercial tour groups are allowed to schedule tours of preserve sites, subject to the provision that such groups abide by prevailing visitation guidelines for that tract. The preserve land manager remains responsible for appropriate land management, including public access, regardless of whether operations, including private group tours, are accomplished by the land manager or through contractual arrangement. Contractual arrangements for guided tours will be non-exclusive with regard to public access.

3.14.2 Film-Making

Film production projects may be allowed subject to approval by the preserve manager and the Coordinating Committee Secretary. The film production process must not negatively impact the preserve environment.

4.0 PROBLEM ANIMAL CONTROL

Certain animals have been identified as potential direct threats to target species, particularly cowbirds, fire ants, and predators. Typical animal control efforts on preserve tracts will likely involve some combinations of the following approaches: public education; manipulation of problem species habitat; selective relocation of individual problem animals; selective destruction of individual problem animals; and destruction of problem animals on a population level. Control efforts should use methods that emphasize maximum selectivity and effectiveness at minimum cost. Destruction of problem animals will be done in a humane manner.

4.1 Deer

White-tailed deer and other browsers can cause serious problems with over-browsing vegetation and need to be controlled. Such methods have been discussed previously in the guidelines found under the section entitled, "Management of Browsing Pressure."

4.2 Cowbirds

Cowbirds, an open-field bird species, are well known for parasitism of songbird nests. It is suggested that management approaches to reduce cowbird populations include the following elements: restoration of native ground cover and dense woodlands for those areas previously disturbed; removal of any supplemental bird feeding stations; elimination of wildlife food plots; and minimization of livestock stables and holding pens. Although these approaches have been associated with reduced cowbird abundance, it may still be necessary to remove individual cowbird eggs from parasitized songbird nests.

Intensive cowbird trapping programs on an interim or permanent basis may be necessary at selected sites. Preserve managers may use trapping, singularly or in conjunction with other habitat manipulation strategies. Trapping should be designed to maximize the effect of cowbird control and minimize capture and loss of non-target species.

4.3 Predators

Bird nest predators may be controlled selectively. Some problem animals that predate songbird eggs and young are domestic and feral cats, raccoons, possums, snakes, jays, and skunks. Managers of preserves adjacent to residential areas should consider a live-trapping program to reduce the number of domestic and feral cats that may hunt songbirds on preserves.

4.3 Fire Ants

Fire ants may be controlled with an integrated Pest Management (IPM) program using approved chemicals and bait formulations. Fire ant control should be designed to minimize impact on native ants and other flora and fauna. Chemical control of exotic fire ant colonies may be necessary to avoid infestation of caves.

5.0 MANAGEMENT OF SPRINGS AND ASSOCIATED WATERCOURSES

Flowing springs and spring runs downstream of spring discharges will be protected from destructive human impacts. This could include such suggested methods as informative markers, and/or fencing, in the case of damaged sites or sites occupied by species of concern. For remote springs, this objective may be achieved simply by designing preserve access points to keep such sensitive sites relatively inaccessible to human visitation.

The introduction of non-native fauna into spring runs is prohibited. Where necessary, spring runs may be fenced to exclude livestock from damaging stream banks and wetland vegetation.

Preserve managers should be aware that both water quality and spring discharge quantity are important to the viability of spring ecosystems. Monitoring should be conducted to design and evaluate management plans that prevent degradation of local groundwater resources or loss of aquatic habitats within preserves. This activity will be done subject to the availability of adequate funding.

6.0 MONITORING AND RESEARCH FOR ENDANGERED SPECIES VIABILITY

Long-term monitoring for endangered species viability will be the responsibility of every managing partner. In order to complete the required 30,428 acre preserve and karst acquisition in a timely fashion, it will be necessary for the Permit holders to direct BCCP

fund resources initially towards purchase of the remaining acres needed. As the preserve system grows, additional funds will be needed for ongoing operation and maintenance of the preserves. While the importance of monitoring and research is evident, it is likely to remain a secondary priority for funding by the Permit holders.

Baseline monitoring studies for biological data will be gathered in each preserve tract in accordance with the Land Management Guidelines and the approved land management plans. Subsequent monitoring as identified in the respective land management plan will be implemented to determine the status of each listed endangered species. These activities will be initiated as soon as possible, contingent upon available funding.

The Coordinating Committee may elect to work with managing partners on the establishment of a joint monitoring effort to be prorated on the basis of the number of acres that each managing partner holds.

6.1 Bird Species

Baseline monitoring studies should concentrate on determining basic population levels on preserve lands, key population parameters, and other ecological parameters that may affect the target species. Demonstration or research projects could be undertaken to determine the effects of different management techniques or specific human impacts on songbird productivity and/or habitat use.

6.2 Cave Invertebrates

Baseline monitoring studies should concentrate on basic inventory and distribution assessments for listed and rare karst invertebrates. Considerable information is needed on cave microclimates and related factors important to invertebrate populations. The effects of different management techniques on subterranean environments and on target karst populations may require complex experimental research designs.

6.3 Spring Systems

Springs and spring runs should be monitored for water quality and seasonal discharge, as well as for populations of aquatic target species. Effects of development within watershed recharge areas might also be considered as research topics for key springs on preserve lands.

6.4 Plants

Baseline monitoring studies should concentrate on plant distribution and abundance patterns within preserves, factors important to plant species survival, and the effects of different management techniques on those factors and on individual populations. Monitoring of browsing population levels as they relate to levels of hardwood regeneration, especially in golden-checked warbler and black-capped vireo habitat, should be an initial emphasis. Non-native and/or ornamental plant species that invade preserves should be removed where practicable to facilitate recovery of native species.

6.5 Community-Based Approaches

Monitoring of natural communities within the preserve system should be done at varying scales of detail. For example, randomly distributed field plots, aerial photographs, and satellite imagery all may be appropriate techniques to assess ecological features. Monitoring of the natural communities will help to determine ecosystem-wide factors affecting the success of the preserve system. Population dynamics for hill-country woodland plants are not well known and will need to be studied in order to predict future woodland and forest distribution and composition.

6.6 Species-Specific Management Strategies

6.6.1 Management of Songbirds

Basic concerns of songbird management include: nest parasitism and predation; vegetation dynamics; habitat fragmentation and edge effects; and conflicts between black-capped vireo and golden-checked warbler habitat requisites and management for the two species when in close proximity.

Nest parasitism by cowbirds and browsing pressure should be controlled using a unified approach. In general, fragmentation of woodlands will decrease habitat quality for target nesting songbirds by increasing exposure of their nests to predation and parasitism. This appears to be true along even narrow trails and small, clear-cut openings within wooded environments. Consequently, vireo and warbler habitat ideally should be managed as large blocks with no interior artificial clearings or cleared right-of-ways. Where existing permanent easements, roads, and trails are already established, site-specific maintenance and monitoring activities should be used.

When the habitats (or potential habitats) of the two key endangered songbirds occupy the same general area, conflicts may arise over which environmental variables to emphasize

in preserve land management strategies. Ultimately, resolution of this technical dilemma may require consultation with USFWS staff, species experts, practicing land managers, and designated species recover teams. General site characteristics, current vegetation cover type, land use history, terms and conditions of the application section 10(a) permit, and the location of individual tracts within the preserve system should be considered when determining management practices at any given location.

Black-Capped Vireo Management: Public access into the vireo habitat during the breeding/nesting season should be strictly regulated. For the purposes of public access, that period is defined as from March 1 to September 1.

Use of prescribed fires and other types of permissible vegetation management techniques used to create or restore vireo habitat must be conducted outside of the breeding season. Selected vireo management sites need to be identified and then manipulated using previously described vegetation control techniques designed to create favorable vireo habitat. Vireo population goals for a given area and associated numbers of managed vireo habitat areas should be established using current technical knowledge.

Golden-Cheeked Warbler Management: Public access into warbler habitat during the breeding/nesting season should be strictly regulated. For the purposes of public access, that period is defined as from March 1 to September 1. To minimize impact from humans, preserve managers may rotate public access among various units of habitat, close trails and roads that enter occupied habitat, or allow only supervised access to trails that provide viewing of target species from the periphery of occupied habitat.

Disturbed woodland interior openings and other areas clear of a mature tree cover should be considered for habitat restoration activities. Overall emphasis for warbler habitat should be placed on native hardwood regeneration. This will likely require direct plantings of native hardwood species in combination with exclusion of browsing animals. In addition, localized thinning of young junipers may be required to reduce competition with hardwoods.

6.6.2 Cave Invertebrates

Public access to caves and larger karst openings should be strictly regulated using a permit system obtained from the appropriate preserve land manager. Fire ant control should be implemented where cave infestations occur that can threaten sensitive cave invertebrates. The surface drainage and sub-surface environment must be maintained in a natural condition with minimal ground and vegetation disturbances.

6.6.3 Plant Species

Preserve sites with observed stands of target plant species should be protected from human disturbance, browsing, and soil erosion, using fencing and other appropriate measures. Preserve land managers may choose to develop plots using rare plant species grown through seed recovery from external populations threatened by destruction, or from other internal or external sources.