

Central Valley Joint Venture Monitoring & Evaluation Plan



Photo by Mark Dettling



Photo by Steve Zack



Photo by Partners in Flight



Photo by Geoff Geupel



Riparian Songbirds

February 2010

Introduction

The Central Valley of California has lost over 98% of its riparian habitat in the past 150 years (Smith 1977, Katibah 1984) and riparian habitat loss may be the most important cause of population declines among songbird species in western North America (DeSante and George 1994). Several once common species are now extirpated from the Central Valley. The Central Valley Joint Venture (CVJV) is seeking to reverse this decline, and in its 2006 Implementation Plan (IP) has developed population objectives for a suite of focal species. Specifically, the CVJV has set 5-year habitat restoration objectives based on the needs of these focal species, as well as target population sizes for nine hydrologic basins of the Central Valley. The focal birds include not only threatened and endangered species, but also more common species that are associated with various types of riparian habitat in the Central Valley (e.g., willow scrub, mature cottonwood forest) and thus are representative of different riparian seral stages and structures.

This monitoring and evaluation plan addresses information needs of the 2006 IP in order to strengthen the capacity of the CVJV to set targets and evaluate success in its effort to recover riparian songbird populations. The following series of seven monitoring and evaluation recommendations discuss the needs to: (1) refine conservation habitat objectives to inform planning in an adaptive manner; (2) establish effective ways to evaluate progress towards habitat protection and population targets; (3) develop tools to improve project selection and implementation; and (4) assess the projected impacts of climate change on riparian songbirds and their habitats. This is not intended to be a complete list of all important issues related to riparian songbirds and their habitats, but rather is intended to focus CVJV activities that will enhance its ability to adaptively manage riparian habitats in the Central Valley. Each section includes a statement of the issue(s) followed by background, a bulleted list of desired products, and a brief explanation of how the expected outcomes relate to CVJV activities. These seven recommendations are then ranked in order of priority based on recommendations from the Riparian Songbird Technical Committee.

1. Population Density Monitoring to Measure Success and Improve Management

Issue:

- In addition to monitoring acreage changes, it is important to directly monitor bird populations. Evaluating the local and regional population-level impacts of the CVJV conservation activities is critical for improving its programs and refining its goals.
- The CVJV currently lacks the framework and capacity for conducting local and regional population monitoring of riparian bird populations.

Background:

The CVJV has defined conservation success based on density targets for riparian birds (CVJV 2006, Chapter 9). What is needed now is a simple framework for using bird monitoring metrics to evaluate changes in density that result from implementing acquisition, restoration, and enhancement projects at both local and regional spatial scales. Formalizing this system will be an important component of assuring that conservation dollars are well spent.

The Implementation Plan defined basin-specific population-size targets based on estimated densities and the amount of potential habitat. The challenge lies in designing a framework that can measure progress toward these targets both at the local scale of individual projects (10s to 100s of hectares), but also be scaled-up to track basin and even regional trends (i.e., Sacramento and San Joaquin Valleys) in riparian bird populations. Regional-scale monitoring is important because it can document increases that occur if habitat conservation is successful, but also decreases that would occur if these activities are not sufficient to offset other sources of habitat loss and degradation.

Density targets can be used to measure the success of projects. With information on project-scale bird densities, managers can quickly evaluate if a project has been successful and alter management if they are not. Measuring progress toward basin-wide population targets will require tracking the amount of habitat that has been restored (see recommendations 2 and 4) and collecting information on bird populations from representative habitats in each basin.

The population targets established in the Implementation Plan are complimentary to continental population targets established by Partners in Flight (Rich et al. 2004). The utility of CVJV targets may be enhanced by placing them in the context of continental population targets, and using this comparison to improve the process of conservation target setting at local, regional, and continental scales.

Desired Products:

- A simple and cost-effective monitoring framework to track project-level responses of focal bird species densities to riparian habitat conservation efforts. This tool should combine monitoring results with the CVJV online project tracking database to help guide project management and reporting.

- A monitoring program designed to track basin-specific changes in riparian bird populations throughout the CVJV primary focal area (valley floor below 300 feet) with detailed survey protocols and training materials for observers and online tools for data visualization and interpretation.
- A report that places CVJV population targets within the context of continental landbird targets.

Expected Outcomes:

Local project effectiveness monitoring as part of an adaptive management system as well as regional population monitoring will provide the best measure of the success of the CVJV in protecting riparian bird species within the region. Local and region-wide monitoring can be used to identify populations that are at risk and prioritize and adapt conservation actions and local effectiveness monitoring.

2. Tracking Net Landscape Change

Issues:

- Estimates of habitat gains and losses at landscape scales are essential to estimate true conservation progress and to set appropriate habitat objectives relative to riparian songbird population levels and distribution.
- The CVJV currently lacks the capability to track both habitat gains and losses at the scale(s) necessary to evaluate the net impact of CVJV programs.

Background:

The central mechanism within the CVJV IP for improving bird populations is to increase the acreage of high quality habitat. To track accomplishments toward these restoration goals, the CVJV maintains an online project database. Habitat acreage goals are tracked by habitat category (palustrine, riverine, upland, agriculture, etc.), habitat type (emergent shrub-scrub, forested, etc.), and water regime (perennial, seasonal, tidal/non-tidal, etc.). The system allows partners to input and track project information, which provides CVJV staff and partners with real-time information on gains in habitat, and hence progress toward CVJV habitat goals. However, habitat losses (e.g., from urban development and changing agricultural cropping patterns) are not currently tracked. The existing CVJV habitat tracking system is thus incapable of providing net assessments of landscape change. This limits the CVJV's ability to develop appropriate strategies for combating habitat loss.

An important conclusion of the North American Waterfowl Management Plan Continental Assessment Report (NAWMP 2007) was that most Joint Ventures could not effectively evaluate progress toward NAWMP population objectives, and could not accurately describe landscape improvements needed to achieve those objectives. This is partially attributable to the limited ability to assess ongoing net landscape change and the lack of a direct relationship of habitat changes to bird vital rates and population sizes. Therefore, the assessment report recommends that Joint Ventures do a better job of monitoring key habitat trends. Although this report was waterfowl-based, these findings and recommendations are relevant to all birds and habitats in the Central Valley

The appropriate interval for change assessment will likely be 5-10 years, because the cost of obtaining some data sets may be quite large, and the ability to detect changes at the landscape scale are known to vary by habitat type.

Desired Products:

- Data collection and mapping of habitat gains, losses, and net change in each planning basin for the different riparian habitat types that are critical for target bird species and identified as part of recommendation one (above).

Expected Outcomes:

Having both net habitat gain and loss data will allow the CVJV to assess the true impacts of its conservation actions and to adjust riparian restoration and enhancement programs to better meet plan objectives.

3. Anticipating Effects of Climate Change on Landbird Populations and Developing Adaptation Strategies

Issues:

- Potential impacts of climate change on landbird habitat and populations must be evaluated, and considered in the design of monitoring and evaluation programs.
- Many entities are currently involved in climate change modeling; our efforts should take full advantage of existing information and models.
- Currently the CVJV has no mechanism for evaluating and planning its activities with climate change adaptation in mind.

Background:

Riparian and wetland habitats in the Central Valley are expected to be greatly impacted by climate change. Changes in temperature, precipitation, snow melt, stream flow, sea level, and various other parameters will likely cause dramatic changes in California's vegetation and bird communities. These impacts could be exacerbated by rapid landscape changes associated with human population increases and urbanization, proliferations of invasive plant species, and reductions in deliverable water quality and quantity. These changes need to be included in the planning and implementation of CVJV projects, as well as monitoring and evaluation of these efforts.

There is a growing body of work that uses ecological niche modeling to project how climate change may cause bird distribution to shift in the future (Wiens et al. 2009). The results of this work suggest that some California species will show dramatic shifts in home range. Some will experience range reductions and perhaps even disappear from California altogether, while others will persist, or even increase as habitats that they favor become more widespread.

These same distributional models are providing insights into how bird communities are expected to change as a result of climate change (Stralberg et al. 2009). This information can be used to identify areas where the turnover in community composition is expected to be high, versus areas where it is expected to be low. These patterns can be used to prioritize areas for restoration based on whether the current community is expected to persist, or design restoration that either targets an existing community or a community that is expected to occur in the future.

Finally, there is a growing awareness that ecological monitoring should be designed within the context of climate change, such that methods can be flexible to accommodate changes in distribution, phenology, and other physical or biological characteristics that may be influenced by climate change.

Desired Products:

- A document that evaluates projected changes in focal species distribution for each of the CVJV basins. This analysis will help us understand if focal species can be expected to persist in all basins despite the effects of climate change.
- A document that uses projected changes in Central Valley bird communities to prioritize areas within planning basins based on the magnitude of projected change.
- Written monitoring recommendations that will help ensure that long-term monitoring is conducted in a way that it can capture distributional shifts in bird populations that may have important implications for habitat restoration.

Expected Outcomes:

Our analysis of projected changes in bird distribution will ensure that monitoring programs are robust to the changes we expect to occur as a result of climate change.

4. Setting Realistic and Specific Riparian Acreage Targets

Issue:

- Restorable riparian acres currently identified by the CVJV Implementation Plan (IP) are likely an overestimate of restorable acreage in the Central Valley.
- The riparian restoration targets in the IP do not include any information on the relative quantity and distribution of different types of riparian vegetation communities (i.e., seral stages).

Background:

A primary assumption of the CVJV IP is that providing specific acreage of high quality riparian habitat will result in estimated bird densities for each focal bird species. The population targets are based on bird density estimates and restorable riparian acres mapped in each basin. Restorable area, as defined, includes all areas with soil types capable of supporting riparian vegetation (excluding developed areas of each basin). These targets for restorable area may be overestimates since they represent the maximum area restorable without accounting for likely future development and other logistical constraints. In addition, these restoration targets are for riparian habitat generically, and do not include an assessment as to what types of riparian vegetation are likely to be supported based on soil type and hydrology. Natural riparian areas are not a single habitat type, but are instead a mosaic of associated habitats in the floodplain. These different riparian habitat types are of varying age and structure and the focal bird species have been selected to reflect the use of these different types of riparian habitat. These different riparian habitats should be incorporated into habitat acreage targets to guide CVJV programs in providing the range of habitats required and set more appropriate population targets for focal species.

One approach to revising the current riparian floodplain acreage (and population targets as a result) is to use soil maps for predicting potential natural vegetation types. Soil profiles develop as a result of time, parent material, topography, climate, and soil biota (Jenny 1941 & 1994). These factors determine the soil properties (e.g. texture, depth to water, alkalinity/salinity, nutrient holding capacities) that influence what vegetation types can be supported. Soil horizons develop relatively slowly (i.e., are relatively stable) and this relative stability across the landscape and time makes soil maps valuable for identifying and mapping potential natural vegetation. Soils are classified hierarchically with the soil series representing the finest scale of mapping and the association representing a group of related series usually occurring within the same landform. The soil series used in all modern soil surveys should provide enough information to create relatively fine-scale maps of potential natural vegetation (Griggs et al. 1992). However, using either spatial scale for mapping soils (soil series or association) will require correlating those soil series or associations with specific vegetation types; the finer the scale, the greater the sampling effort. Site specific and intensive soil sampling and vegetation surveys within a soil mapping unit (series) would be necessary to fully develop successful habitat restoration designs. A useful approach will be to determine the associations between specific soil associations or series and specific vegetation types as defined by Sawyer and Keeler-Wolf

(1995) or Holland (1986). Holland, in particular, would be valuable since it is used as the basis for the California Wildlife Habitat Relationships database, which is useful for large-scale regional planning efforts (Burkett and Conlin 2006). In addition to soil types, the proposed mapping effort would need to account for those areas where the hydrology is relatively intact and, as a result, can continue to support a riparian vegetation community. Areas that are no longer in the active floodplain may not support healthy riparian bird habitat over the long-term. These unsuitable acres would need to be accounted for since it is likely that restoration may not be appropriate, or may not provide desired habitat for bird populations.

Once completed, soil-based vegetation mapping would provide the information needed to map the various types of riparian vegetation and habitat types (e.g., mixed riparian forest, valley oak forest, valley oak woodland, valley oak elderberry savanna, rhizomatous grasslands) across the CVJV planning area. These vegetation types, as reflected by soil diversity, are known to support different assemblages of birds and different bird population densities. The final result of such a mapping effort would be revised restorable riparian floodplain acreages based on the diversity of vegetation types and more realistic bird population target densities.

Desired Products:

- GIS database and maps of current and potential riparian habitat with areas that are likely to support specific types of riparian vegetation identified at a scale consistent with NRCS soil series polygons. These maps might be similar to those developed to describe the potential natural vegetation of the Tulare Basin (Griggs et al. 1992). This database would help the CVJV refine quantitative targets for acres restored and track changes in the quantity of these habitat types over time.
- Revised riparian acreage targets based on these spatial targets.

Expected Outcomes:

These maps will be used to refine basin-scale targets of restorable acres based on the potential natural vegetation. By relating expected bird abundance in each of these habitat types, riparian bird targets can also be greatly improved.

5. Developing a Monitoring Program for Landbird Vital Rates

Issue:

- Vital rate (i.e., nest success and adult survival) targets were identified in the CVJV 2006 Implementation Plan as measures of habitat quality and conservation success that complement information about density and population size.
- The CVJV currently lacks the capability to measure vital rates and link these to local and landscape-scale parameters (e.g., planting design, riparian patch configuration) that need to be evaluated to guide restoration and protection efforts

Background:

While population density is relatively easy to measure, it can be a misleading indicator of habitat quality (Van Horne 1983, Vickery et al. 1992, Schlaepfer et al. 2002). Vital rates (e.g., nest success and adult survival) provide a more direct measure of habitat quality and population dynamics than density alone. To verify that conservation actions are leading to healthy and resilient populations of focal species, survival and/or reproductive success should be measured (Williams et al. 2002).

Although the CVJV Implementation Plan identified nest success and adult survival as vital rates for monitoring, there were no recommendations for how and at what temporal or spatial scales this information should be collected. Measuring vital rates in the field requires a substantial investment in time and effort. As a result, the trade-off between the costs and benefits of detailed vital rate monitoring are often invoked in discussions over the importance of including these measures in monitoring programs. Detailed information on vital rates of focal species collected at local scales, but at enough sites to allow inferences to larger spatial scales, is time consuming and expensive to collect. An alternative is to collect vital rate data for focal species at more coarse spatial scales. These data will not provide information about how specific restoration or habitat management practices influence survival and reproduction, but will allow for tracking regional patterns in vital rates. If low survival or reproductive rates are detected at a regional level, then more detailed studies are warranted to address this problem.

The Monitoring Avian Productivity and Survival program (MAPS; DeSante et al. 1995) can be a cost effective way to measure among-site or temporal trends in vital rates and has been shown effective at detecting moderate to large differences in vital rates with relatively small sample sizes (DeSante et al. 2009).

Desired Products:

- A monitoring plan that implements MAPS Program protocols for measuring variation in vital rates of focal bird species in each of the CVJV Basins. This plan should call for the sampling of a sufficient number of remnant and restored sites so that inferences may be drawn regarding the effects of various habitat attributes on observed trends.
- Addition of vital rate metrics to CVJV online project tracking database.

Expected Outcomes:

Demographic monitoring may improve habitat management by increasing our understanding of how different life history parameters (e.g., fecundity, survival) contribute to observed population trends. If, for example, nest survival is found to be especially low in a particular area, and the cause is identified, then corrective actions (e.g., habitat enhancements) may be taken.

6. Project Selection and Restoration Criteria

Issue:

- Given limited resources, land managers need tools and recommendations for prioritizing and selecting restoration sites at the appropriate spatial scale.

Background:

Given the limitations imposed by logistical and financial constraints, the effectiveness of restoration and conservation in the CVJV implementation region may be enhanced by building a framework for prioritizing on-the-ground actions. Historically, conservation has often relied on qualitative approaches, such as expert opinion, for decision making (Pullin & Knight 2001, Pullin et al. 2004). Unfortunately, these approaches often lack standardization and may be difficult, if not impossible, to replicate when new decisions must be made. As a result, there is a growing emphasis on developing quantitative, data-based tools for prioritizing investments in habitat enhancement and conservation (Sutherland et al. 2004).

The first need is to review existing prioritization tools available in the CVJV. Among these are the evaluations used by NRCS and other funding agencies to rank projects. These typically include whether the project will affect species or habitats of conservation concern, as well as the likelihood of long-term protection of the site. In addition, several conservation organizations have identified specific site or areas that are a high priority for conservation. Examples include The Nature Conservancy's portfolio sites and Audubon's Important Bird Areas. A review of these existing tools for prioritization would identify areas where the CVJV could contribute to existing frameworks and identify areas where the development of new tools or criteria would be warranted.

One approach that may warrant additional effort is using wildlife distribution and abundance information to evaluate conservation and restoration opportunities. This information is often referred to as "habitat suitability", with the assumption that areas where species occur in greater abundance are of higher quality than areas where they are less common (Hirzel and Le Lay 2008). The increasing availability of spatially explicit habitat suitability models is providing new opportunities to guide on-the-ground decision making across a wide range of spatial scales. These models may be useful at both small spatial scales, to identify priority sites and at larger spatial scales to identify species and communities that may be vulnerable to climate change.

Desired Products:

- An explicit framework for prioritizing CVJV activities. This should to the degree possible rely on existing prioritization schemes and tools.
- Habitat suitability models for CVJV focal riparian bird species that can be used in conjunction with other existing methods for prioritization

Expected Outcomes:

Developing these criteria will provide a consistent and effective way to prioritize CVJV conservation projects to ensure conservation investments provide the best outcome possible.

7. “Headline” Indicators of Biodiversity

Issue:

- Beyond the need to measure population responses of focal species, there is a complimentary need to measure the state of systems being restored and how they are changing so that we can stem the overall rate of biodiversity loss.
- While population density targets for individual focal riparian species are an important way to gauge success, this approach can be complimented with community-based multi-species measures of biodiversity.
- There is a need for simple, transparent, and easily interpreted multi-species indicators (e.g., Headline Indicators of Biodiversity; Gregory et al. 2008) that can aggregate the response of multiple species to measure the state of a system – i.e., barometers of change.

Background:

Birds are an effective tool for monitoring because the majority of species are easily and inexpensively detected using standardized sampling protocols, and habitat associations of many species are reasonably well understood. But these strengths also present a challenge; given the diversity of bird species and the variety of habitat characteristics they respond to, how can land managers know which birds are indicators of the habitat conditions that are of interest? One approach to this challenge is the selection of focal species, which are the primary focus of measuring the success of CVJV riparian habitat projects under the 2006 Implementation Plan. However, these focal species still only represent a subset of the bird community and a subset of habitat requirements. Measures of community-level (multi-species) response to conservation activities can compliment this approach by adding information that is a reflection of the overall bird community, vegetation, and environmental conditions. Hence, there are opportunities to use community metrics (such as species richness) or multi-species indices that summarize the response of groups of species that share habitat requirements. This approach, the Headline Indicator approach, is widely used in Europe for example, to track the response of farmland birds to changes in land-use (Gregory et al. 2008).

Riparian bird communities provide an excellent opportunity to develop and apply multi-species indices as measures of restoration success and habitat succession. These approaches can complement the focal species approach by providing a synthetic measure of community response that can be easily explained to the public. Specifically, we expect that multi-species indices will provide information that is easier to communicate to land managers and funders (hence the use of “headline” indicators) and validate the degree to which focal species are accurately representing changes in the larger community.

Desired Products:

- A document that reviews focal species and multi-species approaches for monitoring and makes recommendations for multi-species headline indicators for use by the CVJV.

- Protocol for implementing multi-species indices to measure the success of CVJV riparian habitat projects over time.
- Addition of community-level metrics to CVJV online project tracking database to help guide management and reporting.

Expected Outcomes:

A suite of effective multi-species indicators that will be used to measure the state of riparian bird populations in the Central Valley. This information will ensure that restoration and conservation success are appropriately evaluated using information about changes in riparian bird populations that can be reasonably attributed to changes in vegetation structure and composition.

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