Science and Adaptive Management Committee Meeting
April 22, 2021

Meeting Materials:

Agenda

Minutes

MRGESCP S&T Ad Hoc Group Charge SWFL and YBCU CEM Refinement Ad Hoc [read-ahead, draft]

MRGESCP S&T Ad Hoc Group Charge RGSM CEM/Genetics Refinement Ad Hoc [read-ahead, draft]

MRGESCP 2021 Science Planning Objectives Presented for EC Review on 25 March 2021 [read-ahead]

Draft LTP Reporting Template [read-ahead, draft, spreadsheet]

Review of the MRG Fish Monitoring Program [read-ahead, draft, not included]

MRGESCP 2021 Science Objectives [presentation]

Middle Rio Grande Endangered Species
Collaborative Program
Est. 2000

Science and Adaptive Management Committee (SAMC) Meeting
April 22, 2021
8:00 AM–12:00 PM

Meeting Location: *Zoom*
https://west-inc.zoom.us/j/8983593120?pwd=bU54V3NGeG93bXVlSlJFcEIzcE9wZz09
Meeting ID: 898-359-3120; Passcode: 1251
Call-In: +1-669-900-6833

Meeting Agenda

***Meeting Objectives*:**
- Approve new Science & Technical (S&T) Ad Hoc Groups to be formed
- Finalize science objectives
- Identify strategies for further development
- Learn about tracking relationships among science objectives, science strategies, uncertainties, and activities using the Adaptive Management Relational Database (AMRDB)
- Hear presentation on the Rio Grande silvery minnow (RGSM) Population Monitoring Work Group (PMWG) Ad Hoc Group's summary report and decide on next steps
- Discuss 2021 Middle Rio Grande (MRG) Habitat Restoration (HR) planning direction and proposed workshop
- Provide feedback on the AMRDB and the Long-Term Plan (LTP)

8:00 – 8:10	**Welcome, Meeting Objectives, and Agenda Review** Read-ahead: ☐ Draft March 3, 2021 meeting minutes ✓ **Decision**: Approve April 22, 2021 meeting agenda ✓ **Decision**: Approve March 3, 2021 meeting minutes	*Catherine Murphy, Program Support Team (PST)*

8:10 – 8:40	**Science & Technical Ad Hoc Groups**
	- Update on existing S&T Ad Hoc Groups
	- Upcoming ad hoc group(s)
	   ○ Add level of uncertainty to southwestern willow flycatcher (SWFL) and yellow-billed cuckoo (YBCU) conceptual ecological models (CEMs)
	   ○ Formulate questions to incorporate climate change into future research planning
	
	Read-aheads:
	☐ Draft charge for adding level of uncertainty to SWFL and YBCU CEMs
		Catherine Murphy, PST

	☐ Draft charge for incorporating genetic components into the RGSM CEM ✓ **Decision:** SAMC approval of RGSM CEM Genetics Development Ad Hoc Group charge ✓ **Decision:** SAMC approval of Avian CEM Development Ad Hoc Group charge ➢ **Action:** PST will draft S&T Ad Hoc Group charges for each SAMC-approved group and email them to the SAMC for review and approval ➢ **Action:** SAMC will review draft charges, submit comments to the Science Coordinator, and submit approval to the PST via email ➢ **Action:** Upon SAMC approval of charges, PST will contact the nominated group leads and work with the recommended S&T ad hoc group members to begin meeting to carry out assigned tasks	
8:40 – 9:10	**2021 Science Objectives and Strategy Development** • Update on Executive Committee (EC) meeting • Discuss strategies proposed during the workshops for further development by potential S&T Ad Hoc Groups • Presentation on use of science objectives in Adaptive Management Relational Database Read-ahead: ☐ 2021 Science Objectives with Strategies ✓ **Decision**: Identify one or more strategies for S&T Ad Hoc Group charge development ✓ **Decision**: Finalize 2021 Science Objectives for EC approval ✓ **Decision**: Identify one or more strategies for additional development by S&T Ad Hoc Groups ➢ **Action**: PST will draft S&T Ad Hoc Group charge(s) for the chosen strategies for SAMC review	*Facilitated discussion*
9:10 – 9:40	**Adaptive Management Relational Database (AMRDB)** • Discuss development of the Long-Term Plan (LTP) using AMRDB • Next step: Project prioritization strategy for the LTP Read-ahead: ☐ Draft LTP reporting template ➢ **Action:** PST will classify existing project descriptions to address LTP attribute requirements	*Catherine Murphy, PST*
9:40 – 9:50	**Break**	

9:50 – 10:50	**RGSM PMWG Summary Report S&T Ad Hoc Group – Invited Discussion** • Presentation of revised RGSM Population Monitoring Work Group summary report • Summarize specific areas of disagreement and potential remedies • Discussion of findings and recommendations Read-ahead: ☐ RGSM PMWG Summary Report ➢ **Action:** Submit comments on report to PST by May 15	*Rich Valdez, SWCA Environmental Consultants*
10:50 – 11:50	**2021 MRGESCP Approach to Standardizing Habitat Restoration (HR)** • Discuss requests by City of Albuquerque Open Space and Albuquerque Bernalillo County Water Utility Authority for technical assistance with HR • Discuss request for standardized data collection for MRG HR monitoring and previous efforts to date • Discuss the benefits of a broader monitoring program • Discuss potential HR workshop and format ➢ **Decision:** Host a workshop to organize HR efforts within the MRG ➢ **Action:** PST will draft an HR workshop plan for SAMC review	*Facilitated discussion*
11:50 –12:00	**Meeting Summary and Action Items Review** ➢ **Next SAMC meeting:** Thursday, May 27, 2021, 8am-noon	*PST*
12:00	**Adjourn**	

Middle Rio Grande Endangered Species Collaborative Program

Est. 2000

Science and Adaptive Management Committee (SAMC)
Meeting Minutes

April 22, 2021; 8:00 AM–12:00 PM
Location: Zoom Meeting

Decisions:

- ✓ Approval of April 22, 2021 SAMC meeting agenda
- ✓ Approval of March 3, 2021 SAMC meeting minutes

Action Items:

WHO	ACTION ITEM	BY WHEN
Program Support Team (PST)	Provide comment forms for review of future Science & Technical (S&T) Ad Hoc Group documents	Ongoing
PST	Draft a S&T Ad Hoc Group charge for formulating questions to incorporate climate change into future research planning, and send to the SAMC for review and approval	4/30/21
PST	Add detail to the charges for the Rio Grande silvery minnow (RGSM) and avian conceptual ecological model (CEM) ad hoc groups to clarify the scope of their tasks, and send to the SAMC for review and approval	4/30/21
PST	Following SAMC review and approval, contact the nominated CEM ad hoc group leads and work with members to begin meeting and carrying out tasks	5/7/21
PST	Send out suggested science strategies for immediate development and a poll for SAMC review	4/30/21
SAMC	Review and prioritize science strategies by responding to poll	5/7/21
PST	Classify existing project descriptions to address Long-Term Plan requirements	5/7/21
PST and Rich Valdez	Incorporate preliminary SAMC feedback into the Population Monitoring Work Group (PMWG) summary report and send the draft to PMWG members with a comment matrix for findings, assumptions and recommendations	4/28/21
PMWG members	Submit a completed comment matrix for the PMWG summary report to PST	5/5/21
SAMC	Submit comments on the summary report to PST	5/21/2021
PST	Draft a habitat restoration (HR) workshop plan for SAMC review	5/20/2021

Next Meeting: May 27, 2021

Meeting Summary

Welcome, Meeting Objectives, and Agenda Review

Catherine M., PST Science Coordinator and SAMC Facilitator, opened the meeting and led introductions. Catherine M. reviewed the April 22, 2021 meeting agenda and objectives and March 3, 2021 meeting minutes. The meeting agenda was amended. Summary points are below:

- The charge for incorporating genetic components into the RGSM CEM is still in draft form.
- Wade Wilson, U.S Fish & Wildlife Service, requested the opportunity to make changes to group membership and deliverable dates.
- The SAMC will review and approve the charge over email.
- The SAMC requested comment forms for reviewing future S&T Ad Hoc Group documents.
  - These forms could be added to the SAMC work page on the Portal.

- ✓ **Decision**: The SAMC approved the March 3, 2021 SAMC meeting minutes
- ✓ **Decision**: The SAMC approved the April 22, 2021 SAMC meeting agenda
- ➢ **Action Item**: The PST will provide comment forms for review of future S&T Ad Hoc Group documents

Science & Technical Ad Hoc Groups

Catherine M. gave an update on current and proposed S&T Ad Hoc Groups. Summary points are below:

- Rich V., SWCA Environmental Consultants, will share the findings and recommendations from the RGSM summary report during a later agenda topic.
- Charles Yackulic, U.S. Geological Survey, will complete the RGSM model in the summer.
- Wade W. is assembling a group to work on the RGSM CEM.
- The PST produced a draft charge for characterizing the level of uncertainty in the avian CEMs.
  - The CEMs will be standardized and added to the Adaptive Management Relational Database (AMRDB) in table form.

Comments:

- The charge for the avian CEMs S&T Ad Hoc Group is vague. It is not clear whether the groups will provide professional judgement or data analysis to characterize uncertainty.
  - Species experts will provide only their best professional judgement, as was used to develop the CEMs originally.
- The first step should be to get the models under same structure.
  - Although the RGSM and avian model schematics look different, they are similar in table form. The avian CEMs currently do not characterize the level of uncertainty, which is what the S&T Ad Hoc Group will add.
- The charge should be updated to include the information discussed. This will help define the scope of the charge.
  - The PST will add the table formats of the CEMs to the CEM S&T Ad Hoc Group charges and explain in the charges how the tables will be used to address uncertainties.
- The CEMs are not finalized once in the AMRDB; they will be updated as new data comes in. Now, the PST is working to get all the data in before content development ends in June and the design team begins working on building the database infrastructure.

Summary points for additional updates are below:

- Catherine M. and Debbie Lee, Program Manager have been discussing a list of questions suggested by Megan Friggens that relate to future planning and climate change and can be included in all future project descriptions. The SAMC can charge an S&T Ad Hoc Group with developing the list of questions.
    - S&T Ad Hoc Groups seem to have more defined scopes and deliverables. This group will have an umbrella effect on other efforts.
    - The PST will produce a draft charge for SAMC review.
    - U.S. Army Corps of Engineers (USACE) has a leading climate scientist who may be able to support this effort. USACE also incorporates climate change into every study and has developed tools for predicting how it will affect the future.
- The PST will wait for Wade W.'s input on the RGSM CEM ad hoc group charge before sending it to the SAMC for approval.

Comments:

- Both CEM Ad Hoc Group charges are vague and have unclear scopes and tasks.
    - The PST will add detail to the charges to clarify the scope of their tasks, and send to the SAMC for review and approval.
    - Scopes should be narrow, so deliverables can be developed in an achievable and useful timeframe, and for groups to end once their charges have been fulfilled.
- What role does the SAMC play in S&T Ad Hoc Group deliverables? Does the SAMC direct a group to address a knowledge gap, or does the SAMC develop strategies for addressing the knowledge gap through iterative task development with the group?
    - It depends on the topic, but it is up to the SAMC to decide on a case-by-case basis.
    - The SAMC uses the deliverables that come from S&T Ad Hoc Groups to provide recommendations with justifications to the Executive Committee (EC).
    - The relationship between an S&T Ad Hoc Group and the SAMC could range from direct SAMC involvement with each task to SAMC review of deliverables only.

- ➤ **Action Item**: The PST will add detail to the charges for the RGSM and avian CEM ad hoc groups to clarify the scope of their tasks, and send to the SAMC for review and approval
- ➤ **Action Item**: Following SAMC review and approval, the PST will contact the nominated CEM ad hoc group leads and work with members to begin meeting and carrying out tasks
- ➤ **Action Item**: The PST will draft a S&T Ad Hoc Group charge for formulating questions to incorporate climate change into future research planning, and send to the SAMC for review and approval

2021 Science Objectives and Strategy Development

Catherine M. discussed the science objectives and strategies. Summary points are below:

- The objectives will be referred to as "science objectives" to avoid confusion and address EC feedback.
- The science objectives were presented to the EC for review. The EC had no comments and the science objectives will be up for approval at the July EC meeting.
- The SAMC can use the science objectives to develop strategies. Catherine M. sent a document with the science objectives and preliminary science strategies. Catherine M. highlighted the strategies that are ready for implementation, as they are primarily desk exercises utilizing existing data.

- o Field efforts will need more time and resources to implement.
- Some science objective statements had multiple parts. To enter these more easily into the AMRDB, the PST is considering renumbering these to be sequential instead of hierarchical.
- The PST will compile the strategies and set up a poll for SAMC review.
    - o The poll results will guide conversation at the next meeting.

- ➢ **Action Item**: The PST will send out the suggested science strategies for future development and a poll for SAMC review
- ➢ **Action Item**: The SAMC will review and prioritize science strategies by responding to poll

Adaptive Management Relational Database (AMRDB)

Catherine M. discussed science planning with the AMRDB (see presentation). Summary points are below:
- The Science & Adaptive Management (S&AM) Plan outlines the process for the MRGESCP, while the Long-Term Plan lays out implementation of the S&AM Plan.
- As the science objectives evolve, both plans will be updated. The cycle of updates drives adaptive management in the MRGESCP.
- Science objectives will be linked to projects in the AMRDB, which enables transparent prioritization for long-term planning.
    - o The SAMC is responsible for developing the transparent and standardized prioritization process.
    - o By entering the relevant information into the AMRDB, the SAMC can develop an algorithm for assessing the linkages of each project. For example, a project that links to multiple objectives, strategies, and critical uncertainties would merit higher priority.
- Two types of users of the AMRDB have been identified: scientific users and administrative users. There are different queries for both types.
    - o Users can generate reports from query results; one example of a report is the Long-Term Plan.
- The AMRDB will capture the activities already being done in service of the Collaborative Program's mission and add value to them by linking them to MRGESCP science objectives, strategies, uncertainties, etc.
- There are five categories for all activities in the AMRDB: habitat assessments & modeling, species management & recovery, population management & modeling, program management & administration, field & laboratory experiments.
    - o HR would be considered a field experiment. It is a manipulation of the physical environment and pre- and post-project monitoring should be done.
        - Comments:
            - ▪ A scientific experiment has a null hypothesis before it begins. Existing HR efforts cannot be treated like experiments. It makes sense to prioritize treating HR projects as experiments moving forward.
            - ▪ An experiment requires pre-project baseline data for comparison, but mostly occurs is post-project monitoring.
            - ▪ Restoration should follow a more scientific, question-driven process than it does now.
    - o MRGESCP members have repeatedly asked for a way to improve HR and show success. The only way to address those requests is to design HR projects that look more like experiments moving forward. The SAMC needs to support those efforts.

- More rigorous monitoring costs money, but MRGESCP members may be able to collaborate on these efforts.
- The SAMC should be considering how to use the connections in the AMRDB to recommend priority projects to the EC.
  - The group needs to come up with a weighted scoring method.

Comments:
- Is there a way to develop a proposal via the AMRDB?
  - The AMRDB stores all the proposals that have been developed and will score them based on linkages. This will help managers choose projects to fund.
  - New proposals should come from addressing the science objectives and strategies.
  - The AMRDB will also document scientific uncertainties and relationships among variables in the CEMs. You could develop a proposal to address a big uncertainty that improves understanding of many relationships in a CEM.
- Is there a way to classify the importance of an uncertainty?
  - Many uncertainties come from the CEMs. Species experts need to judge whether uncertainties are critical and reducible.

RGSM PMWG Summary Report S&T Ad Hoc Group – Invited Discussion

Rich V. presented an update on the PMWG summary report. Summary points are below:
- The summary report was written as an assignment by the EC, to be provided to the SAMC and EC for approval. The set of recommendations in the report can be addressed by Science & Technical Ad hoc Groups.
- The PMWG was tasked with 1) Conducting a workshop on catch-per-unit-effort (CPUE), 2) Reviewing the Fish Monitoring Plan (FMP), and 3) Updating the FMP. The PMWG did not address Task 3 before it was sunsetted by the EC in December 2020.
- As part of Task 1, the Hubert science panel conducted a workshop and provided a report. The PMWG identified 22 recommendations and sent a letter to the U.S. Bureau of Reclamation (Reclamation) requesting that they be implemented. Eight recommendations were implemented and are currently part of the FMP.
- 20 seine hauls are conducted at 20 sites each month to calculate CPUE by site. The average CPUE is an average of all sites.
- The FMP implemented a recommendation for using alternative sites when standard sites dry.
  - Replacement sites were selected through a generalized random tessellation stratified system to prevent bias.

Comments:
- How many of the analyses of the science panels were sanctioned by the PMWG?
  - Two sets of analyses were done by members of the PMWG. A modeling process was also initiated with Charles Y.
- Do the 20 seine hauls overlap?
  - They do not. Each seine haul is taken for distinct, separate mesohabitats. Researchers are trying to characterize density across the full spectrum of mesohabitats.
- Are the data available for each seine haul?
  - Data are available by seine haul starting in 2020.
- Are the lengths of the seine hauls predetermined?
  - They try to keep seine hauls to under 20-30 meters long. The beach seine is 10 feet wide by 6 feet tall.

- What does a dry site refer to?
  - A dry site is one that is dry between April and November, when sampling occurs. There is no accounting for when sites dry between sampling.
- How do you account for the availability of different mesohabitats?
  - One of the PMWG's recommendations is to account for the variability in mesohabitat availability.
  - Charles Y.'s model has made adjustments for capture probability by mesohabitat.

Summary points continued:

- Data from the FMP are used often in recovery plans (including as a census), in the 2016 Biological Opinion (BO) incident take statement, for determining augmentation targets, for evaluating BO compliance, for environmental analyses, for estimating population parameters in various models, etc.
- The PMWG findings were consolidated to four basic findings: 1) The FMP has provided 26 years of monitoring, 2) The current FMP provides monthly data for estimated population parameters, 3) Sampling design and methodology are not necessarily suited for evaluating species responses to management actions, 4) A complete redesign of the FMP is not warranted.
  Comments:
  - The FMP data might be appropriate to address certain management questions, but that would be rare.
  - How was it determined that a redesign is not warranted? Was that consensus?
    - The PMWG could not reach consensus about any finding or recommendation. Based on the intention and results of the FMP, it seems to be functioning well.
  - The 20 standard sites are located downstream of where water management is occurring. The FMP, therefore, reflects the response to cumulative actions occurring upstream.
    - CPUE is driven by volume of the flow of the river, which is not a function of water operations. It is hard to tie CPUE to management actions.
- There are key scientific assumptions in the FMP that need to be acknowledged: 1) The mean October CPUE index represents the overall density of RGSM in the river and 2) The year-to-year changes in CPUE reflect the effects of river flow on the population due to management actions. There are recommendations to address both assumptions. The FMP assumes CPUE is a reflection of what is going on in river.
  Comments:
  - Assumption 1 is inherent to any sampling program.
    - Yes, but you can evaluate the representation of the sampling design.
  - Is it safe to say that access to the floodplain is what affects CPUE each year?
    - That is one hypothesis.
  - This puts too much emphasis on management actions. In a dry year, the snowmelt is just not available.
    - Any alternative language to represent that is welcome.
  - CPUE is used for incidental take estimates, etc., so it is already assumed that it reflects management actions.
    - The mechanisms behind this correlation need to be better understood.
  - Even if there is disagreement on the findings, it is important to put them forward. The SAMC can decide to take them to the EC or put them to rest.

- There were six objectives listed under PMWG task 2. Rich V. posed 18 fundamental questions for these objectives with responses and critical uncertainties. Some questions were answered by the PMWG. The remaining questions led to 11 recommendations.
    - The recommendations are on Table 3 of the PMWG Summary Report, which consolidates and summarizes the information presented in the report.
- The 11 recommendations are split into Category 1 (involve additional field work) and Category 2 (no field work).
    - Category 1 Summary:
        - Rec 1 – Continue implementing the FMP with recommendations from the Hubert science panel.
        - Rec 2 – Supplement the FMP with additional sites in October when the September CPUE is low.
            - Comment: Does this bias results?
                - Results with additional sites are presented separately.
        - Rec 3 – Evaluate the use of other sampling gears in addition to beach seines.
            - The group is divided. Some believe beach seines are adequate, others believe the fish population is not being adequately represented in sampling.
        - Rec 4 – Resolve the relationship between CPUE and total abundance.
        - Rec 5 – Determine mesohabitat measurements to improve hydraulic habitat models.
    - Category 2 Summary:
        - Rec 6 – Refine the FMP to optimize precision, representativeness, and demographic data parameters.
            - Existing data could be used to simulate different sampling designs.
        - Rec 7 – Compare other analytical methods against the mixture model for calculation of CPUE.
            - The PMWG is divided. Some believe the mixture model is adequate, others believe it should be reevaluated. Both science panels recommended that the mixture model be evaluated further.
        - Rec 8 – Develop a library of customizable experimental designs for assessing management actions.
        - Rec 9 – Develop integrated population models.
            - Charles Y. is developing a model, but additional models may be needed.
        - Rec 10 – Draft a FMP for approval by the SAMC and EC.
        - Rec 11 – Evaluate the recommendations of all four RGSM science panels (PAP 2005, Adkins 2012, Hubert 2016, and Noon 2017).

Comments:
- What are the recommendations in Rec 11 being evaluated for?
    - The science panels made separate recommendations for the FMP. These should be compiled and cross-matched to find any overlap.
    - The PST is compiling this information in the AMRDB.
- Has there been any thought into developing a FMP that assesses management actions?
    - The PMWG did not discuss this much. Charles Y. and Rich V. determined that it is not possible to monitor the effect of one management action with the FMP, but the integrated model may be used to determine effects. Rec 9 addresses this.
- Is there a distinction between large-scale and small-scale management actions?

- o There is no distinction yet, but it should be made in Rec 8.
- Are there specific strategies for Rec 4?
  - o In other programs, CPUE is often compared to a mark-recapture estimate, which is completely independent of CPUE.
    - Long-term mark-recapture method is not feasible for RGSM because it is small and short-lived. Short-term mark-recapture is possible.
  - o It may also be possible to block off part of river and do depletion estimates.
- Is Rec 8 referring to designs for additional monitoring and not using the existing FMP?
  - o These additional monitoring efforts are separate from the FMP and targeted at specific actions or projects. They would be implemented as needed and more short-term in scope.
  - o Assessments could be done by the organization carrying out the activity, instead of by the U.S. Fish and Wildlife Service (USFWS), but USFWS permitting would be needed for some activities.
  - o There is no design that fits every need, but there can be customizable generic designs.
- Thomas Archdeacon submitted comments on the PMWG summary report. The comments and the discussion around them are summarized below:
  - o 1) The group largely did not provide input until the report was in draft form.
    - There were 29 meetings of the PMWG over eight years. Rich V. went through notes and presentations from each meeting and presented the topics from them in the report.
  - o 2) The analyses in the report were not done together or agreed upon. There are unresolved issues with non-peer reviewed citations in the report.
    - Rich V. has indicated whether a reference was peer reviewed or not.
    - Many analyses were done by PMWG members for group purposes and were not peer-reviewed. All analyses were sent to the PMWG and open for comment. Comments were incorporated into the analyses and are reflected in the PMWG summary report.
  - o 3) There is no documentation of areas of disagreement in the PMWG.
    - More work needs to be done to clarify where there was disagreement.
    - Scientific justification for different opinions needs to be provided by PMWG members.
    - A table summarizing disagreement could be part of the appendix.
    - Request to match recommendations with their respective science panel(s).
      - Some do not reflect science panel recommendations exactly. Rich V. can cite the science panels associated with recommendations.
  - o 4) Peer reviewed work was either not included or called "preliminary".
    - Rich V. updated works that were marked "preliminary".
- Non-consensus needs to be reflected in the document.
  - o The other PMWG members should review the findings and recommendations, vote on them and explain their reasoning.
  - o The directive should come from the SAMC instead of Rich V.

- ➢ **Action Item**: Rich Valdez and the PST will incorporate preliminary SAMC feedback into the PMWG summary report and send the draft to PMWG members with a comment matrix for findings, assumptions and recommendations
- ➢ **Action Item**: PMWG members will submit completed comment matrices for the PMWG summary report to Catherine Murphy

➢ **Action Item**: The SAMC will submit comments on the summary report to the PST

2021 MRGESCP Approach to Standardized Monitoring for Habitat Restoration (HR)

Catherine M. opened discussion on HR (see presentation). Summary points are below:

- The PST received a request to address the idea of a standardized protocol for monitoring HR in the MRG.
  - There is no one-size-fits-all way to address all needs for HR, but there are things that can be done to address larger ecosystem-level or reach-level questions.
  - There are examples in other areas of larger monitoring schemes that expand on the inferences made from individual HR projects.
- The PST is developing a draft HR Monitoring Plan for the Middle Rio Grande (MRG).
- Some benefits of participating in a broader monitoring program include addressing larger questions, providing context for evaluating success at the site level, sharing findings and lessons learned, technical assistance with sampling design, and linking HR projects with CEMs, recovery criteria, and science objectives.
- As a potential lead-in for a workshop on HR, the SAMC could host a series of webinars on past and ongoing HR.
  - Webinars could be split into terrestrial, aquatic, and floodplain restoration activities. Signatories would be invited to speak on their HR projects in the spring and summer, before a workshop in August.
- The preliminary questions for the HR webinars ask about HR objectives, location and status, target species, biotic and abiotic metrics, the definition of success and targets, control sites, pre- and post-project monitoring, and lessons learned.
- Proposed workshop format: overview, summary of presentations, presentations on proposed/future projects, group discussion/activity to identify common objectives, define appropriate metrics, and generate reach-level context questions.
- The three types of monitoring for HR are construction monitoring, performance monitoring, and monitoring to support adaptive management.

Comments:

- The need for standardized monitoring has been identified for a while. Suggestion to focus on monitoring instead of construction and design at the webinars. Explain what worked and what did not. There is opportunity to learn from what was done.
- Where is known information on HR projects compiled?
  - There have been robust efforts to compile aquatic HR information in the MRG. GeoSystems Analysis, Reclamation, and USACE each have HR databases. NMISC compiled them into one geo-spatial database (RioRestore), which is hosted on the Program Portal.
  - There are many construction specifics in those databases. The webinars should focus on getting ideas for a monitoring plan across sites.

➢ **Action Item**: The PST will draft a HR workshop plan for SAMC review

Meeting Participants

Alan Hatch	EC *Ex Officio* Member
Ara Winter	Statistics/Modeling Expert
Ari Posner	Geomorphology Expert
Catherine Murphy	Program Support Team, SAMC Facilitator
David Moore	Terrestrial Ecology Expert
Debbie Lee	Program Support Team
Meaghan Conway	Ecosystem Function Expert
Megan Friggens	Climate Science Expert
Melissa Welsch	Program Support Team
Michelle Tuineau	Program Support Team
Rich Valdez	SWCA Environmental Consultants
Ryan Gronewold	Hydrology Expert

Middle Rio Grande Endangered Species Collaborative Program (MRGESCP)
Science & Technical (S&T) Ad Hoc Group Charge
Southwestern Willow Flycatcher and Yellow-billed Cuckoo
Conceptual Ecological Model Refinement Ad Hoc

Approved by Science and Adaptive Management Committee (SAMC) on _____, *2021*.

Parent Committee
Science and Adaptive Management Committee*.*

Ad Hoc Group Charge
Describe the level of scientific uncertainty for each relationship characterized in the Middle Rio Grande (MRG) conceptual ecological models for the southwestern willow flycatcher (*Empidonax trailii extimus*; SWFL) and yellow-billed cuckoo (*Coccyzus americanus*; YBCU). The CEMs can be found in Appendix C of the MRGESCP 2020 Science and Adaptive Management Plan (WEST 2020), tabular versions of which will be provided for assigning uncertainty to each relationship between a driver or stressor and a life stage response.

Membership
    A. Criteria for membership
- Knowledge of SWFL and/or YBCU life history and ecology within the MRG;
- Familiarity with MRGESCP Science and Adaptive Management Plan (WEST 2020) and avian CEM development.

    B. Member List
    Amy Erickson, (Lead) Audubon New Mexico,
    Meaghan Conway, NM Department of Game and Fish,
    Dave Moore, Bureau of Reclamation Technical Service Center,
    Ondrea Hummel, TetraTech,
    Vicky Ryan, U.S. Fish & Wildlife Service,
    Others?

Iterative Task Development

Background
Life stage-based CEMs are being developed for each of the five species under the purview of the MRGESCP. In order to aid in the prioritizing of research and conservation efforts, each relationship between a driver or stressor variable and a life-stage response is characterized by importance to recovery of the species, ability to manage and scientific uncertainty. The current models for SWFL and YBCU provide designations for level of importance and ability to manage, but not for level of scientific uncertainty about these relationships. The task described below will remedy these omissions and help to inform adaptive management strategies for SWFL and YBCU recovery.

This task will help to prioritize and address Critical Uncertainties SWFL2, SWFL3, SWFL5, YBCU1 and YBCU5 identified in the *Middle Rio Grande Adaptive Management Framework: Identifying Critical Scientific Uncertainties* (Caplan et al. 2018):
- SWFL2: The impact of the tamarisk beetle (*Diorhabda*) on SWFL breeding habitats in the MRG.

- SWFL3: SWFL breeding population sizes, distributions, and trends along the Angostura Reach.
- SWFL5: The abiotic and biotic variables that predict suitable and unsuitable SWFL habitats across multiple spatial and temporal scales in the MRG.
- YBCU1: The abiotic and biotic variables that predict suitable YBCU breeding habitats in the MRG across multiple spatial and temporal scales.
- YBCU5: The timing and availability of YBCU prey in the MRG and which factors influence both.

The SAMC requests that you review the draft task, deliverables and schedule below and provide feedback and questions to begin the iterative process of task development.

Tasks and Deliverables

Task 1: Characterize level of scientific uncertainty in SWFL and YBCU CEMs

Characterize the level of scientific uncertainty (i.e., High, Medium, or Low) for each relationship characterized in the MRG CEMs for the SWFL and YBCU. The CEMs can be found in Appendix C of the MRGESCP 2020 Science and Adaptive Management Plan (WEST 2020), tabular versions of which will be provided by the Program Support Team for assigning uncertainty to each relationship between a driver or stressor and a life stage response.

Objective of Task 1:
Characterizing the scientific uncertainty for each relationship between a driver or stressor variable and a life-stage response in the CEMs will help prioritize research and conservation efforts.

Deliverable:
1) Table format of each CEM with levels of scientific uncertainty (i.e., High, Medium, or Low) assigned to each relationship (i.e., row in the table) between a driver or stressor variable and a life stage response.
2) Identification of any areas of disagreement, if applicable, as well as any comments on accuracy of tabular conversion of the original CEMs.

Timeline and Reporting Scheduling

Task	Subtask	Deliverable	To Be Completed By
Task1: Characterize scientific uncertainty in SWFL and YBCU CEMs	NA	Modified table of SWFL CEM; modified table of YBCU CEM	TBD
		Presentation to SAMC	TBD

References:

Caplan, T., D. Lee, G. Wilde, H. Walker, and J. Frey 2018. Middle Rio Grande Adaptive Management Framework: Identifying Critical Scientific Uncertainties. Prepared for U.S. Army Corps of Engineers Albuquerque District on behalf of the Middle Rio Grande Endangered Species Collaborative Program. Prepared by GeoSystems Analysis, Inc. Albuquerque, New Mexico.

Western EcoSystems Technology, Inc. 2020. Middle Rio Grande Endangered Species Collaborative Program Science and Adaptive Management Plan. Prepared for the Executive Committee of the Middle Rio Grande Endangered Species Collaborative Program, Albuquerque, NM. 98 pp.

Middle Rio Grande Endangered Species Collaborative Program (MRGESCP)
Science & Technical (S&T) Ad Hoc Group Charge
Rio Grande Silvery Minnow Conceptual Ecological Model/Genetics Ad Hoc

Approved by Science and Adaptive Management Committee (SAMC) on _____*2021*.

Parent Committee
Science and Adaptive Management Committee*.*

Ad Hoc Group Charge
Identify a series of genetic components that inform, and are informed by, the life history characteristics of the Rio Grande silvery minnow (RGSM), propagation and augmentation of the species, and environmental influences in the Middle Rio Grande (MRG). Incorporate these components into the conceptual ecological model (CEM) for the RGSM, found in Appendix B of the MRGESCP 2020 Science and Adaptive Management Plan (WEST 2020).

Membership
  A. *Criteria for membership*
      - Knowledge of RGSM genetics, life history and ecology within the Middle Rio Grande;
      - Familiarity with MRGESCP Science and Adaptive Management Plan (WEST 2020), RGSM Genetics and Propagation Plan (CABQ et al. 2018a), and RGSM Augmentation Plan (CABQ et al. 2018b).

  B. *Member List*
      Wade Wilson (Lead), U.S. Fish and Wildlife Service, *Accepted*
      Alison Hutson, New Mexico Interstate Stream Commission,
      Kathy Lang, City of Albuquerque BioPark,
      Megan Osborne, University of New Mexico,
      Tom Turner, University of New Mexico,
      Dana Price, U.S. Army Corps of Engineers,
      Michael Porter, U.S. Army Corps of Engineers

Iterative Task Development

Background
RGSM genetic data guides and informs the propagation and augmentation plans. Thus, this work is also integral to our understanding of population dynamics. Any representation of RGSM population-level responses to environmental influences, therefore, should also include factors that affect the augmented species' genetic integrity and diversity. The current conceptual ecological model for RGSM currently fails to capture the full suite of threats to recovery of the species.   The task described below will remedy these omissions and help to inform adaptive management strategies for RGSM recovery.

Specifically, this task addresses Recommendation 5 from the Fraser et al. Independent Science Panel on RGSM Genetics (AFWE&I 2016):
> *"The Science Workgroup (led by the Program) and the Genetics Workgroup (led by the USFWS) should integrate the genetics data and the decision-making more carefully. Specifically, there should be more translation of the genetics research into the adaptive*

management process, hatchery broodstock practices, and the integration of the past 15 years of research (genetics and ecology combined)."

The SAMC requests that you review the draft task, deliverables, and schedule below and provide feedback to begin the iterative process of task development.

Tasks and Deliverables

Task 1: Add genetics components to RGSM CEM
Identify a series of genetic components that inform, and are informed by, the life history characteristics of the RGSM and its environmental influences in the Middle Rio Grande. Incorporate these components into the conceptual ecological model (CEM) for the RGSM, found in Appendix B of the MRGESCP 2020 Science and Adaptive Management Plan (WEST 2020).

Objective of Task 1:
Incorporate genetic components into the RGSM CEM to facilitate additional linkages to Collaborative Program Objectives and RGSM recovery criteria.

Deliverable:
1) Schematic of RGSM CEM (provided by PST) modified to include genetic components and relationships with other components and life stages.
2) Presentation of modified schematic to SAMC, followed by discussion.

Task 2: Characterize relationships among RGSM CEM components
Indicate the level of influence and level of uncertainty for each relationship between pairs of components in the RGSM CEM.

Objective of Task 2:
Characterize the relationships with the added genetic components in the RGSM CEM to identify critical uncertainties for further study.

Deliverable:
Table of individual relationships between pairs of components in the RGSM CEM (provided by PST) with levels of influence (on RGSM population dynamics) and uncertainty characterized as High, Medium or Low.

Timeline and Reporting Scheduling

Task	Subtask	Deliverable	To Be Completed By
Task1: Add genetic components to RGSM CEM	NA	Modified schematic of RGSM CEM	May 21, 2021
		Presentation to SAMC	June SAMC meeting
Task 2: Characterize relationships	NA	Modified table of relationships in RGSM CEM	May 21, 2021

References:

Amec Foster Wheeler Environment & Infrastructure, Inc. 2016. Final Summary Report: Expert Peer Review of the Middle Rio Grande Endangered Species Collaborative Program's Rio Grande Silvery Minnow Genetics Project. Prepared for the U.S. Bureau of Reclamation, Albuquerque, NM.

City of Albuquerque, New Mexico Interstate Stream Commission, US Fish and Wildlife Service, and University of New Mexico. 2018. Rio Grande Silvery Minnow Genetics Management and Propagation Plan 2018-2022. City of Albuquerque BioPark, Albuquerque, NM.

City of Albuquerque, New Mexico Interstate Stream Commission, University of New Mexico, US Bureau of Reclamation, and US Fish and Wildlife Service. 2018. Rio Grande Silvery Minnow Annual Augmentation Plan 2018-2022. City of Albuquerque BioPark, Albuquerque, NM.

Western EcoSystems Technology, Inc. 2020. Middle Rio Grande Endangered Species Collaborative Program Science and Adaptive Management Plan. Prepared for the Executive Committee of the Middle Rio Grande Endangered Species Collaborative Program, Albuquerque, NM. 98 pp.

MRGESCP 2021 Science Planning Objectives
Presented for Executive Committee review on 25 March 2021

Below is the list of MRGESCP scientific planning objective statements drafted at the February 10-11, 2021 Objectives Workshops and revised by the Science and Adaptive Management Committee (SAMC). These statements are presented to the Executive Committee for review and the final revision will inform recommended updates to the EC-approved Science and Adaptive Management Plan, Adaptive Management Relational Database, and Long-Term Plan for the MRGESCP.

Workshop Attendees (Day 1 - RGSM)	Workshop Attendees (Day 2 – Avian/Other)
Alison Hutson, NMISC	Alyssa O'Brien, City of ABQ Open Space
Alyssa O'Brien, City of ABQ Open Space	Amy Erickson, Audubon Southwest
Andy Dean, USFWS ES Office	Andy Dean, USFWS ES Office
Anne Marken, MRGCD	Ari Posner, USBR
Ara Winter, BEMP	Casey Ish, MRGCD Conservation Program
Ari Posner, USBR	Dave Moore, USBR Technical Service Center
Ashlee Rudolph, USBR	Debra Hill, USFWS
Carolyn Donnelly, USBR	Eric Gonzales, USBR
Casey Ish, MRGCD Conservation Program	Grace Haggerty, NMISC
Charles Yackulic, USGS	Hector Garcia, USBR
Cynthia Naha, Santo Domingo Pueblo	Jenny Davis, USFWS
Dale Strickland, WEST, Inc.	Lawrence Abeita, BIA
Debra Hill, USFWS	Liza Yazzie, Realty Specialist, USBR
Eric Gonzales, USBR	Mark Kelly, ABCWUA
Grace Haggerty, NMISC	Maya Pinon, Rep. Deb Haaland--NM01
Guilherme Dias, UNM Department of Biology	Meaghan Conway, NMDGF
Hector Garcia, USBR	Megan Friggens, USFS Rocky Mountain Research Station
Liza Yazzie, Realty Specialist, USBR	Mo Hobbs, ABCWUA
Mark Kelly, ABCWUA	Ondrea Hummel, Tetra Tech
Maya Pinon, Rep. Deb Haaland--NM01	Ryan Gronewold, USACE
Meaghan Conway, NMDGF	Trevor Birt, NMISC
Megan Osborne, UNM	*Catherine Murphy, PST*
Mick Porter, USACE	*Debbie Lee, PST*
Mike Marcus, MRG Water Advocates Board	*Melissa Welsch, PST*
Mo Hobbs, ABCWUA	*Michelle Tuineau, PST*
Nate Caswell, USFWS New Mexico FWCO	
Nathan Schroeder, Pueblo of Santa Ana	
Quantina Martine, Audubon Southwest	
Reynalden Delgarito, USACE	
Rich Valdez, SWCA, representing NMISC	
Ryan Gronewold, USACE	
Steve Zipper, SWCA	
Thomas Archdeacon, USFWS-NMFWCO	
Catherine Murphy, PST	
Debbie Lee, PST	
Julie Dickey, PST	
Melissa Welsch, PST	
Michelle Tuineau, PST	

RGSM Objective A-1

Original statement: *Analyze available monitoring data for the RGSM from Cochiti Reservoir to Elephant Butte Reservoir to track population trends in the MRG.*

Revised statement: **Estimate the abundance of augmented and wild born RGSM populations in the Angostura, Isleta, and San Acacia reaches from year to year.**

RGSM Objective A-2

Original statement: *Continue to support research into the life history of the RGSM to further inform management of the species.*

Revised statement: **Increase understanding of how the life history traits of the RGSM change over time and space, to better inform management of the species and increase the probability of recovery.**

RGSM Objective A-3

Original statement: *Support research and modeling efforts to determine how much base flow is needed to produce sufficient habitat to support species survival rates necessary to achieve a self-sustaining population in each reach.*

Revised statement: **Determine the relationships between base flow and survival and recruitment of RGSM in the Middle Rio Grande.**

RGSM Objective A-4

Original statement: *Support research and modeling efforts to determine timing, duration, and magnitude of flows needed to produce sufficient habitat in support of species recruitment rates for a self-sustaining population in each reach.*

Revised statement: **Determine suitable environmental flow (i.e., timing, duration and magnitude of spring hydrograph) needed to cue spawning and recruitment for the RGSM population, given system constraints and opportunities.**

RGSM Objective A-5

Original statement: *Contribute to research and modeling efforts to better understand the quantity and quality of habitat needed at different flow regimes to support recruitment and survival of RGSM.*

Revised statements:
A-5.1) Refine existing research and modeling efforts to understand the quantity and quality of habitat available at different flow regimes.

A-5.2) Develop a range of options for increasing habitat availability and refugia at life stage-limiting flow regimes for all life stages.

RGSM Objective A-6

Original statement: *NA*

Proposed statements:
A-6.1) **Evaluate the effects of species management (i.e., propagation, augmentation, rescue/salvage) on RGSM genetic diversity.**

A-6.2) **Evaluate the effects of species management (i.e., propagation, augmentation, rescue/salvage) on RGSM population viability.**

SWFL Objective B-1

Original statement: *Continue monitoring for SWFL in designated critical habitat areas to track territories in the MRG management unit of the Rio Grande recovery unit.*

Revised statement: **Monitor for SWFL in the MRG management unit of the Rio Grande recovery unit.**

SWFL Objective B-2

Original statement: *Continue monitoring critical SWFL habitat and contribute to research on the impacts from non-native and exotic species on SWFL recovery.*

Revised statement: **Determine habitat availability for SWFL within the MRG.**

SWFL Objective B-3

Original statement*: Support large-scale restoration efforts to protect and expand SWFL habitat in the MRG.*

Revised statements:
B-3.1) Characterize optimal breeding habitat conditions in currently occupied SWFL locations to inform restoration.

B-3.2) Manage successional processes that maintain existing SWFL breeding habitat in the Program Area.

B-3.3) Expand SWFL breeding habitat through restoration efforts in the Program Area.

YBCU Objective C-1

Original statement*: Contribute to research and understanding of habitat needs for the YBCU.*

Revised statements:
C-1.1) Characterize optimal habitat (i.e., foraging and nesting) conditions on landscape and microhabitat levels in currently occupied YBCU locations to inform habitat mapping and restoration efforts.

C-1.2) Determine successional processes that promote optimal YBCU habitat (i.e., foraging and nesting) in the Program Area.

C-1.3) Expand monitoring efforts for YBCU.

NMMJM Objective D-1

Original statement: *Contribute to efforts to expand habitat and preserve existing habitat in the MRG.*

Revised statements:
D-1.1) Initiate and support NMMJM monitoring efforts to locate existing populations, identify relevant habitat features, and identify potentially suitable unoccupied habitat..

D-1.2) Contribute to efforts to expand habitat and preserve existing habitat in the MRG.

PESU Objective E-1

Original statement: *Continue monitoring for PESU stands in the West-Central New Mexico Recovery Region and preserve habitat.*

Revised statements:
E-1.1) Continue and expand monitoring and surveying for PESU stands in the West-Central New Mexico Recovery Region.

E-1.2) Preserve and expand existing habitat stands in the West-Central New Mexico Recovery Region.

OTHER Objective F-1

Original statement: *Monitor the status of other threatened species in the MRG.*

Revised statement: *Monitor trends in ecosystem function in the MRG for indications of decline (e.g., changes in vegetation structure and composition, population trends in other special status species, etc.).*

OTHER Objective G-1

Original statement: *Support the establishment and maintenance of a Conservation Storage pool in Abiquiu Reservoir status of other threatened species in the MRG.*

Revised statement: *Support efforts to enhance the operational flexibility of water managers to support species.*

OTHER Objective H-1

Original statement: *NA*

Proposed statement: ***Determine the impacts from non-native vegetation on listed species' habitat availability and population dynamics.***

Science Objective	Science Strategy	Project	Hypothesis	Uncertainty	Type of Program Activity					Project Focus							Hydrologic Conditions			Reach						Authority					
					Habitat Assessments & Modeling	Species Management & Recovery	Population Monitoring & Modeling	Program Management & Administration	Field & Laboratory Experiments	NMMJM	PESU	RGSM	SWFL	YBCU	Other	MRG Ecosystem	Wet Year	Average Year	Dry Year	Northern	Cochiti	Angostura	Isleta	San Acacia	Not Applicable	2016 MRG	BDD	ABCWUA	USACE B2B	CoA General Plan	RGSM Prop Plan
Objective A1	Strategy 1.1	Project 1		RGSM1			X					X					X	X				X	X			RPMX					
		Project 2						X							X				X			X	X			RPMX					
		Project 3			X							X														RPMX		RPMX			
Objective F1	Strategy 1.1	Project 4			X											X	X	X	X	X						RPMX		RPMX			
		Project 5					X						X							X											
Objective B3	Strategy 3.2	Project 6	Hypothesis 3-A	SWFL3					X				X				X	X	X				X								
		Project 7					X			X													X							Action X	
		Project 8					X								X										X					Action X	
		Project 9					X						X	X								X	X	X							
Objective C1	Strategy 1.2	Project 10	Hypothesis 2-A	YBCU1					X					X			X	X	X			X	X	X							
		Project 11				X							X	X					X			X	X	X							
		Project 12		NMMJM1	X					X								X					X							
Objective E1	Strategy 1.3	Project 13	Hypothesis 1-C	PESU1					X		X												X							

Science Objective	Science Strategy	Project	Hypothesis	Uncertainty	Type of Program Activity					Project Focus						Hydrologic Conditions			Reach					Authority					
					Habitat Assessments & Modeling	Species Management & Recovery	Population Monitoring & Modeling	Program Management & Administration	Field & Laboratory Experiments	NMMJM	PESU	RGSM	SWFL	YBCU	MRG Ecosystem	Wet Year	Average Year	Dry Year	Northern	Cochiti	Angostura	Isleta	San Acacia	2016 MRG	BDD	ABCWUA	USACE B2B	CoA General Plan	RGSM Propagation Plan
Objective B1	Strategy 1.1	2019 SWFL Surveys					X						X									X	X	RPMX					
Objective C1	Strategy 1.3	2019 YBCU Surveys					X							X								X	X	RPMX					
		City of Albuquerque Aquatic Conservation Facility Rearing and Breeding Operations and Maintenance				X						X												RPMX		RPMX			
Objective A1	Strategy 1.1	Evaluation of Rio Grande Silvery Minnow Population Model Alternatives	Current mixture model is most suitable for computing RGSM CPUE.	RGSM4; RGSM13			X					X												RPMX		RPMX			
		Otolith Validation Study	Using otoliths to determine age of wild larvae is feasible.	Length at age in larval development					X			X																	
		Otolith Age Comparison by Reach	Growth trajectories of wild-captured larval RGSM do not differ across three reaches of the Rio Grande.	Environmental factors impacting larval development					X			X				X	X				X	X	X						
		Candelaria Nature Preserve Wildlife Inventory				X									X						X							Action X	
		Candelaria Nature Preserve Hydrology and Soils			X										X						X							Action X	
		Habitat Restoration in the Isleta and San Acacia Reaches							X			X	X	X	X			X				X	X						
		Los Lunas Habitat Restoration Project Monitoring							X																				

Project ID	(Coding for species, hierarchy)					
Date Entered						
Project Name						
Project Category	(See annual report)					
Objective Link						
Uncertainty Link						
Hypothesis Link						
Project Focus	NMMJM	PESU	RGSM	SWFL	YBCU	MRG Ecosystem
Reach(es)	Northern	Cochiti	Angostura	Isleta	San Acacia	
Temporal Scale						
Hydrology Conditions	High	Medium	Low			
Biotic Presence	NMMJM	PESU	RGSM	SWFL	YBCU	
Type of Program Activity	Habitat Assessments & Modeling	Species Management & Recovery	Population Monitoring & Modeling	Program Management & Administration	Field & Laboratory Experiments	
Contribute to CP Operations/Admin/(	Y/N					
Authority Links	2016 MRG	BDD	ABCWUA	USACE B2B	etc.	
Total Cost	Estimated	Actual				
Annual Cost	By year					
Short Description						
SOW Link						
Contracted	Yes	No				
Contracting Period	Starting FY	Ending FY				
Anticipated Completion						
Contracting Agency						
Contract Number						
Point of Contact						
Contractor						
Partner Organizations						
Deliverable Deadlines						
Links to report/data						
Findings Publication	Report	Peer review article				
Presentation to Program	Y/N					
Findings Incorporated in Database	Y/N					
Findings Incorporated into CEMs	Y/N					
Notes	Notes Types as diff values					

Middle Rio Grande Endangered Species Collaborative Program

2021 Science Objectives

22 April 2021

Science & Adaptive Management Committee Meeting

DRAFT 2021 Science Objectives - RGSM

Objective A-1: Estimate the abundance of augmented and wild born RGSM populations in the Angostura, Isleta, and San Acacia reaches from year to year.

Objective A-2: Increase understanding of how the life history traits of the RGSM change over time and space, to better inform management of the species and increase the probability of recovery.

Objective A-3: Determine the relationships between base flow and survival and recruitment of RGSM in the Middle Rio Grande.

Objective A-4: Determine suitable environmental flow (i.e., timing, duration and magnitude of spring hydrograph) needed to cue spawning and recruitment for the RGSM population, given system constraints and opportunities.

DRAFT 2021 Science Objectives - RGSM

Objective A-5:

A-5.1: Refine existing research and modeling efforts to understand the quantity and quality of habitat available at different flow regimes.

A-5.2: Develop a range of options for increasing habitat availability and refugia at life stage-limiting flow regimes for all life stages.

Objective A-6:

A-6.1: Evaluate the effects of species management (i.e., propagation, augmentation, rescue/salvage) on RGSM genetic diversity.

A-6.2: Evaluate the effects of species management (i.e., propagation, augmentation, rescue/salvage) on RGSM population viability.

DRAFT 2021 Science Objectives - SWFL

Objective B-1: Monitor for SWFL in the MRG management unit of the Rio Grande recovery unit.

Objective B-2: Determine habitat availability for SWFL within the MRG.

Objective B-3:

B-3.1: Characterize optimal breeding habitat conditions in currently occupied SWFL locations to inform restoration.

B-3.2: Manage successional processes that maintain existing SWFL breeding habitat in the Program Area.

B-3.3: Expand SWFL breeding habitat through restoration efforts in the Program Area.

DRAFT 2021 Science Objectives - YBCU

Objective C-1:

C-1.1: Characterize optimal habitat (i.e., foraging and nesting) conditions on landscape and microhabitat levels in currently occupied YBCU locations to inform habitat mapping and restoration efforts.

C-1.2: Determine successional processes that promote optimal YBCU habitat (i.e., foraging and nesting) in the Program Area.

C-1.3: Expand monitoring efforts for YBCU.

DRAFT 2021 Science Objectives - NMMJM

Objective D-1:

D-1.1: Initiate and support NMMJM monitoring efforts to locate existing populations, identify relevant habitat features, and identify potentially suitable unoccupied habitat.

D-1.2: Contribute to efforts to expand habitat and preserve existing habitat in the MRG.

DRAFT 2021 Science Objectives - PESU

Objective E-1:

E-1.1: Continue and expand monitoring and surveying for PESU stands in the West-Central New Mexico Recovery Region.

E-1.2: Preserve and expand existing habitat stands in the West-Central New Mexico Recovery Region.

DRAFT 2021 Science Objectives - OTHER

Objective F-1: Monitor trends in ecosystem function in the MRG for indications of decline (e.g., changes in vegetation structure and composition, population trends in other special status species, etc.).

Objective G-1: Support efforts to enhance the operational flexibility of water managers to support species.

Objective H-1: Determine the impacts from non-native vegetation on listed species' habitat availability and population dynamics.

Middle Rio Grande Endangered Species Collaborative Program
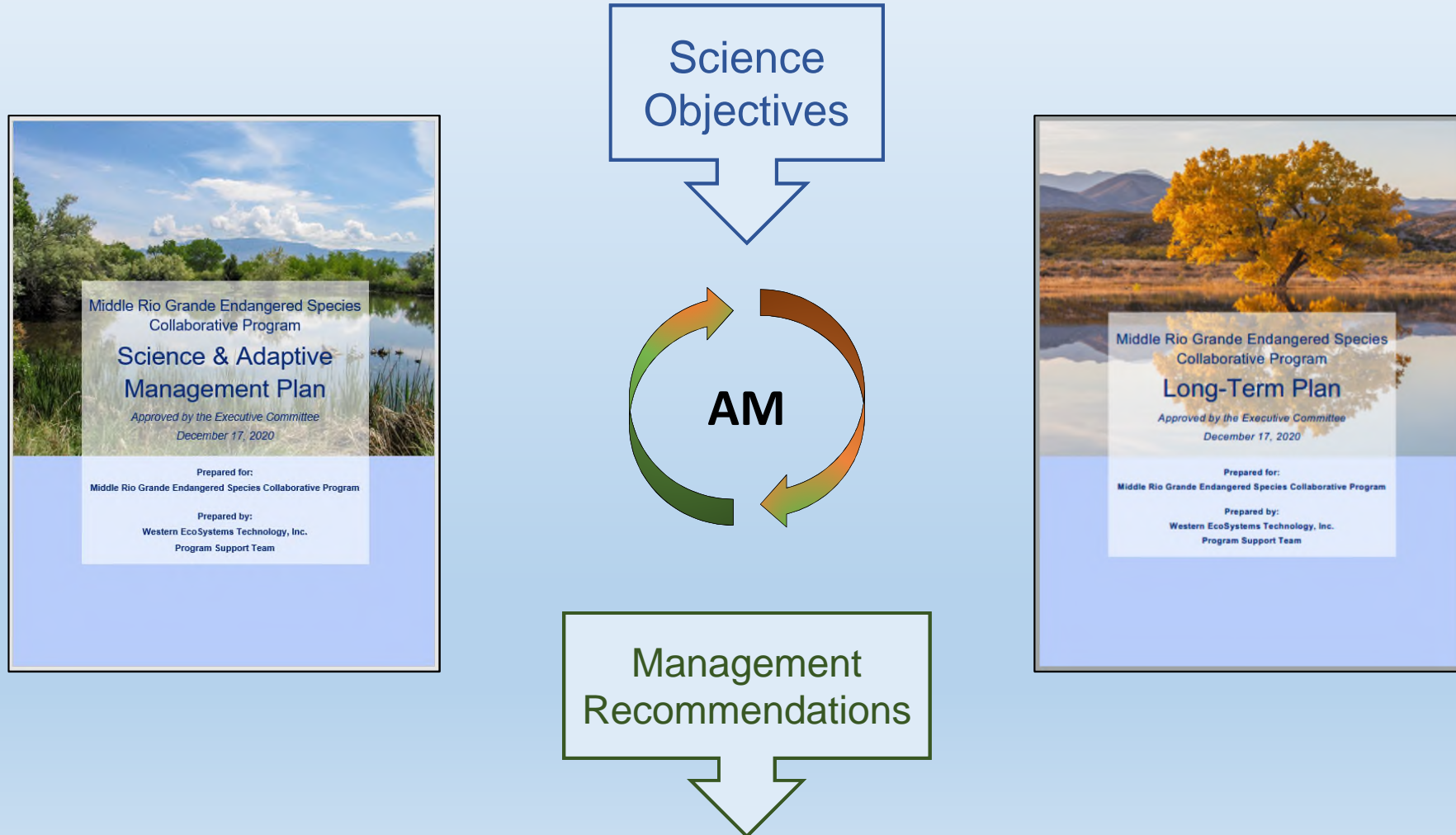
Science Planning with the AM Relational Database

22 April 2021

Science & Adaptive Management Committee Meeting

Science & Adaptive Management Process

Science Objectives Workshop – February 10-11, 2021

- ✓ Purpose:
  - ❖ Align the Collaborative Program's scientific planning objectives with its mission statement and goals.
  - ❖ Appraise the objectives and associated strategies yearly with input from stakeholders and technical experts.
- ✓ 40 participants representing ~20 organizations/offices
- ✓ Revised/drafted 23 objective statements to address MRGESCP goals
- ✓ Reviewed by EC; ready for integration into AM Relational Database
- Suggested strategies will be assessed by SAMC and further developed by Science & Technical ad hoc groups
- Science objectives are being linked to projects to enable transparent prioritization for long-term planning

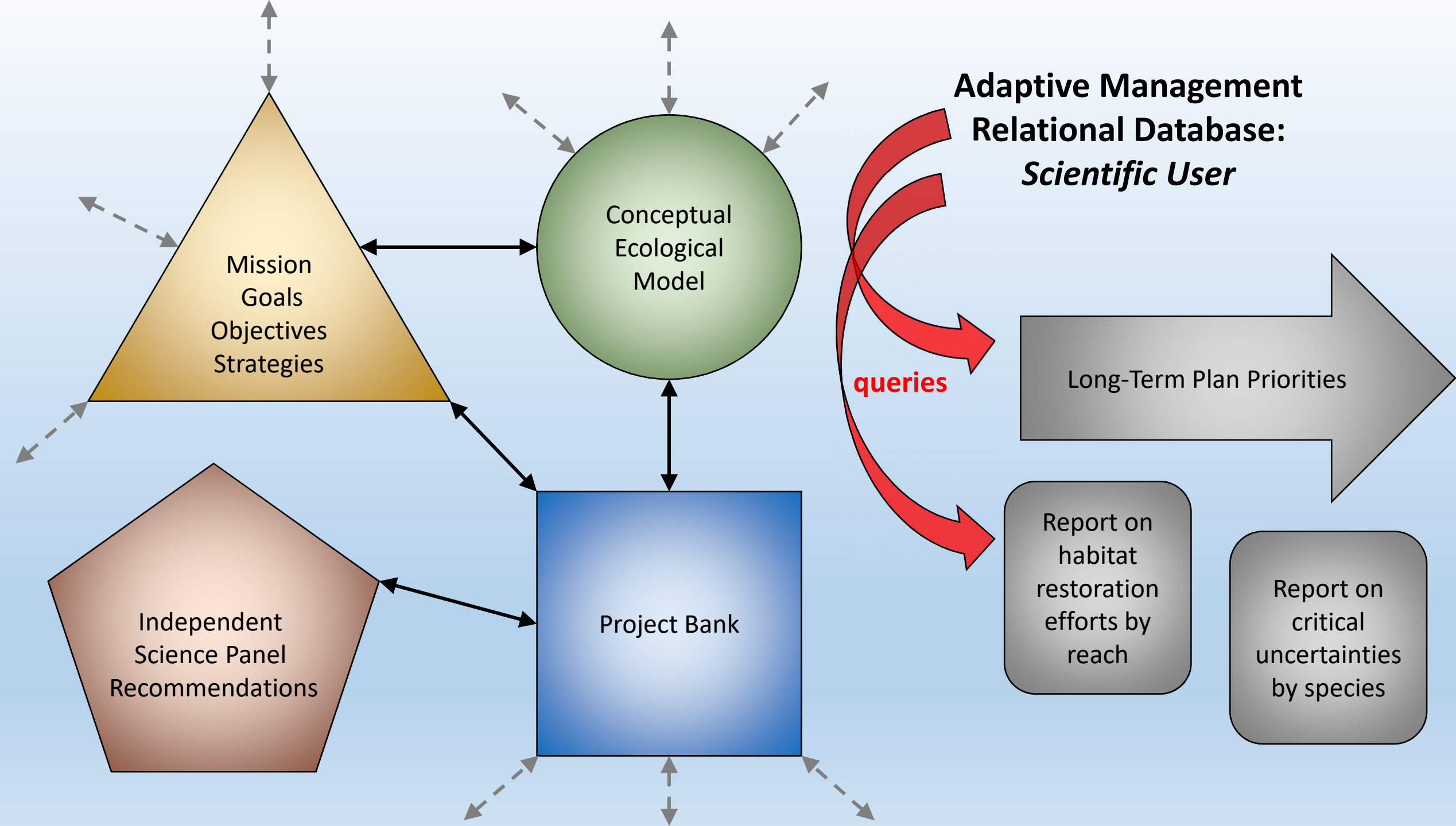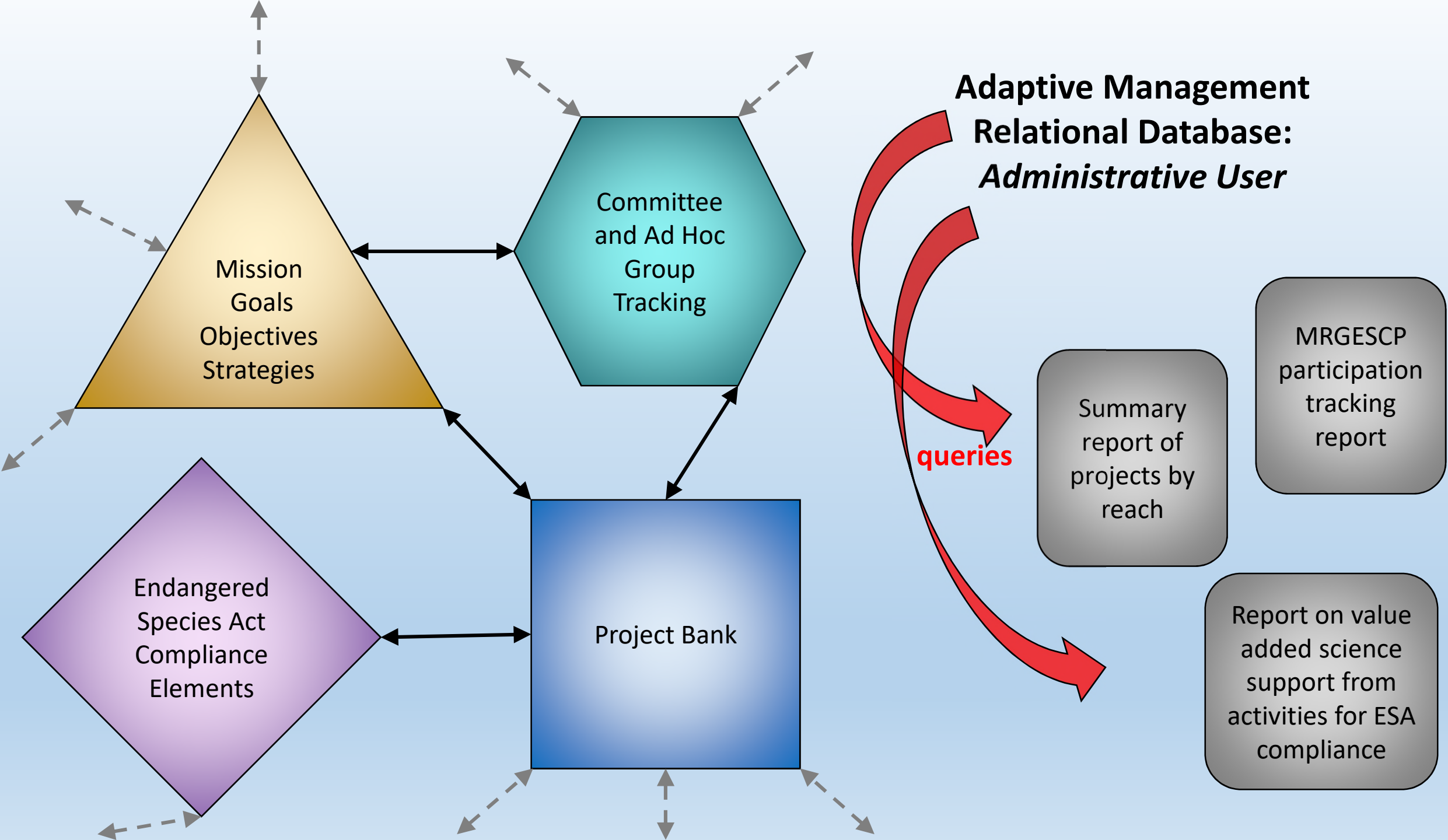# Science & Adaptive Management pathways – YBCU example
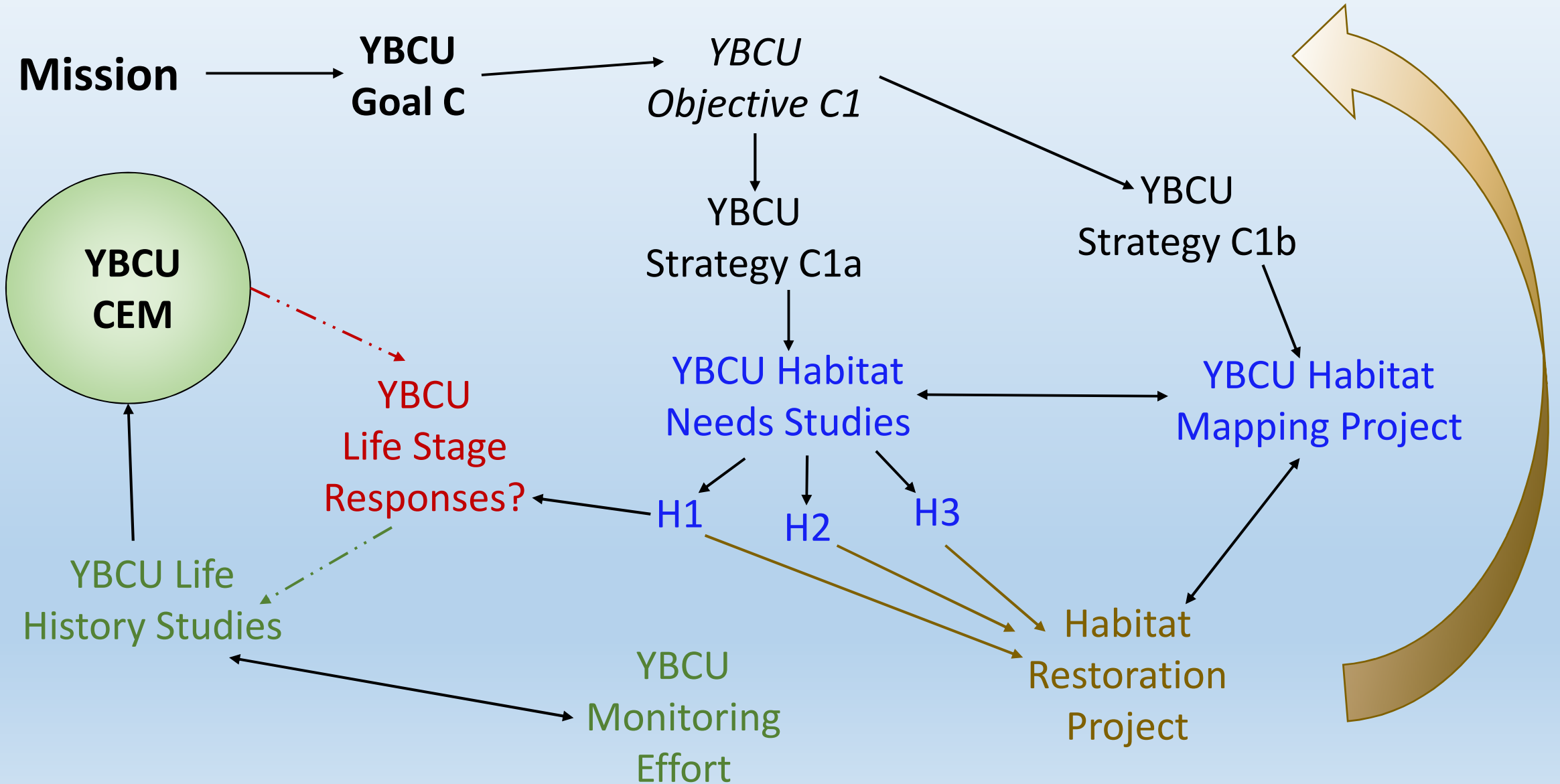
Science & Adaptive Management pathways – AMRDB tables
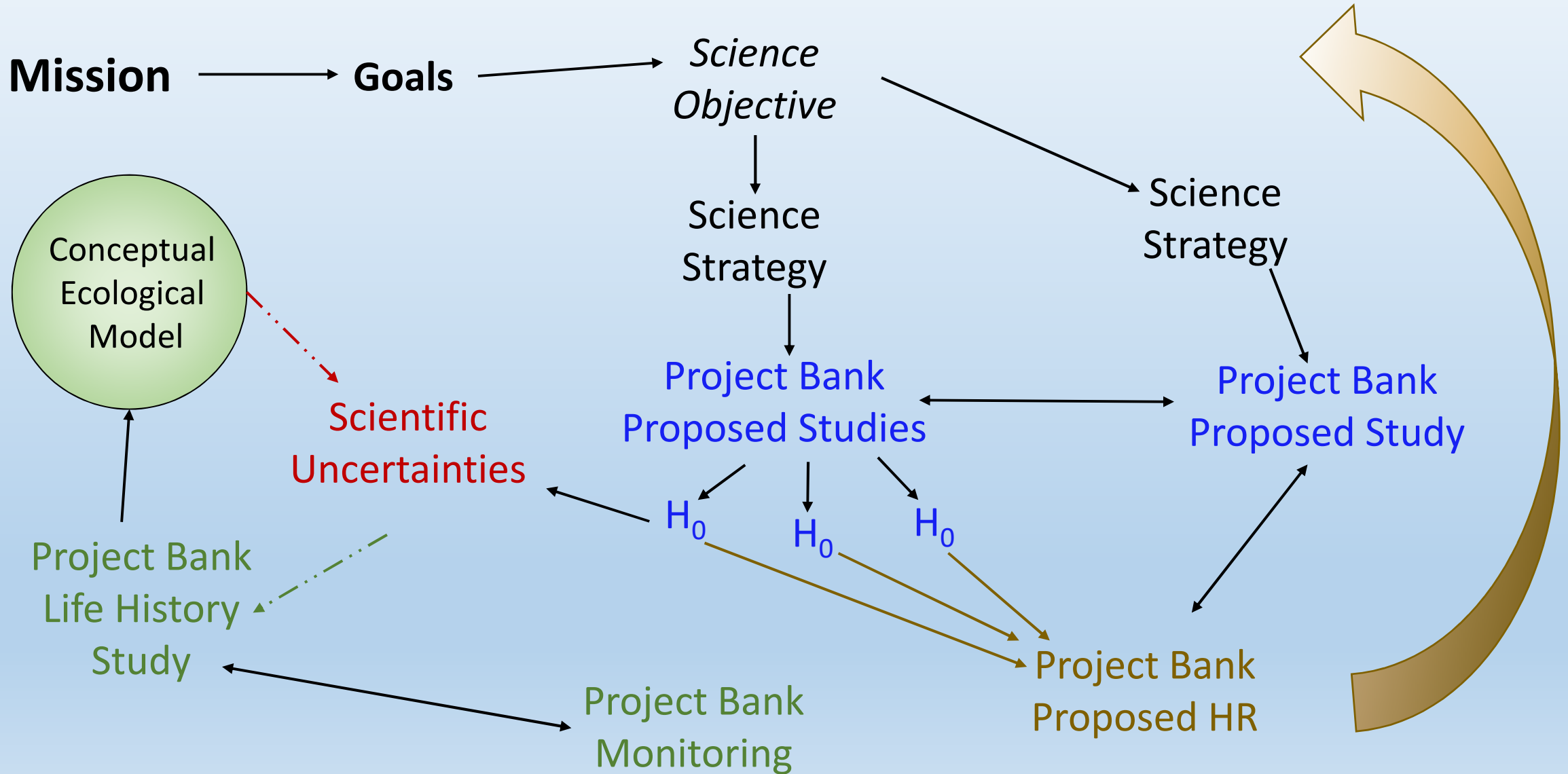
Adaptive Management Relational Database

- User – a Collaborative Program participant wishing to search for information and generate reports on MRGESCP activities (completed, ongoing, proposed), and to relate activities to science and adaptive management initiatives.
  - ➢Scientific user – a user with scientific or technical queries, such as:
    - ❑Track progress being made on critical uncertainties
    - ❑Summarize scientific investigations by reach, species or type
    - ❑Determine how a particular project supports the science objectives
  - ➢Administrative user – a user with administrative queries, such as:
    - ❑Track participation in MRGESCP ad hoc groups and committees
    - ❑Quickly summarize projects by reach, species or type
    - ❑Evaluate science support gained from carrying out activities for ESA compliance

Adaptive Management Relational Database: *Scientific User*

Mission Goals Objectives Strategies

Conceptual Ecological Model

queries

Long-Term Plan Priorities

Independent Science Panel Recommendations

Project Bank

Report on habitat restoration efforts by reach

Report on critical uncertainties by species

Example of report: Long-Term Plan

					Type of Program Activity					Project Focus						
Science Objective	Science Strategy	Project	Hypothesis	Uncertainty	Habitat Assessments & Modeling	Species Management & Recovery	Population Monitoring & Modeling	Program Management & Administration	Field & Laboratory Experiments	NMMJM	PESU	RGSM	SWFL	YBCU	Other	MRG Ecosystem
Objective A1	Strategy 1.1	Project 1		RGSM1			X					X				
		Project 2						X							X	
		Project 3			X								X			
Objective F1	Strategy 1.1	Project 4			X											X
		Project 5					X						X			
Objective B3	Strategy 3.2	Project 6	Hypothesis 3-A	SWFL3					X				X			
		Project 7						X		X						
		Project 8						X							X	
		Project 9					X						X	X		
Objective C1	Strategy 1.2	Project 10	Hypothesis 2-A	YBCU1					X					X		
		Project 11				X							X	X		
		Project 12		NMMJM1	X					X						
Objective E1	Strategy 1.3	Project 13	Hypothesis 1-C	PESU1					X		X					

Middle Rio Grande Endangered Species Collaborative Program

Habitat Restoration Monitoring Plan for the MRG

22 April 2021

Science & Adaptive Management Committee Meeting

MRG Habitat Restoration Monitoring Plan

Benefits of a broader monitoring program:

- Address reach-level (or larger) questions,

- Provide context necessary for properly evaluating HR success at the site-level,

- Share findings and lessons learned,

- Technical assistance with design, protocols and analysis,

- Link individual projects with CEMs, species-monitoring, Recovery criteria and Program science objectives

MRG Habitat Restoration Monitoring Plan

Host series of webinars on past/ongoing HR efforts to inform and lead up to a workshop:

May	June	July	August	September
Terrestrial HR Webinars - invited speakers: - COA - Santa Ana - MRGCD	Aquatic HR Webinars - invited speakers: - ABCWUA - NMISC - USBR - USACE	Floodplain HR Webinars - invited speakers: - BEMP - BDD - Sandia	HR Workshop - A. Rudolph - G. Haggerty - NMDGF	Synthesize findings - Commonalities - Standards - Reach level questions

MRG Habitat Restoration Monitoring Plan

Questions for HR webinar slide template:

1. What is your organization's objective regarding habitat restoration?
2. Where is your HR project located and what is the current status (proposed, ongoing, complete)?
3. For which target species are you restoring or creating habitat?
4. What biotic and abiotic metrics do you measure?
5. How do you define success for your project? What are the target metrics?
6. Does your project design include a control site for comparison?
7. Do your HR projects include pre- and post-construction monitoring?
8. Can you share any lessons learned (from planning, construction or monitoring) regarding successes, failures or unexpected outcomes?

MRG Habitat Restoration Monitoring Plan

Format of workshop could include:

- Overview – purpose, goals and benefits

- Summary of presentations on past/ongoing HR projects from webinar series

- Presentations on proposed/future HR efforts

- Group discussion/activity to identify common HR objectives, define appropriate metrics and generate reach-level context questions

MRG Habitat Restoration Monitoring Plan

Next Step: Consider three types of restoration monitoring:

(1) to determine whether a particular project was completed as specified in the restoration plan (<u>construction monitoring</u>)

(2) to evaluate the performance of a restoration project relative to the project objectives (<u>performance monitoring</u>)

(3) to learn from the restoration effort in structured ways to enhance the effectiveness of restoration efforts over the long-term (<u>monitoring to support adaptive management</u>)