Review of the Edwards Aquifer Habitat Conservation Plan.

The National Academies of Sciences

Presentation to EAHCP Science Committee
November 7, 2018
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NAS Report 3 Charge

“The third report will focus on the relationships among Conservation Measures, Biological Objectives, and Biological Goals”

“Whether the Conservation Measures in the EAHC P are adequate to meet the Biological Objectives, and whether the Biological Objectives will meet the Biological Goals”

Conservation Measures
Springflow, Water Quality, Habitat

Biological Objectives
Springflow, Water Quality, Habitat

Biological Goals
Habitat & Population
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Conservation Measures: Springflow, Water Quality, Habitat

Biological Objectives: Springflow, Water Quality, Habitat

Biological Goals: Habitat & Population
Development of NAS 3 Consensus Report
Development of NAS 3 Consensus Report
Development of NAS2 Consensus Report
Development of NAS3 Consensus Report
NAS 3

Will the Conservation Measures achieve the Biological Objectives?

**CONSERVATION MEASURES**

Springflow, Water Quality, Habitat

**BIOLOGICAL OBJECTIVES**

Springflow, Water Quality, Habitat

**BIOLOGICAL GOALS**

Habitat & Population

39 individual Conservation Measures simplified to 5 major categories:

- Springflow protection
- Water Quality protection
- SAV Management
- Recreation Management
- Riparian Management
NAS 3

**CONSERVATION MEASURES**
Springflow, Water Quality, Habitat

**BIOLOGICAL OBJECTIVES**
Springflow, Water Quality, Habitat

**BIOLOGICAL GOALS**
Habitat & Population

Will the Conservation Measures achieve the Biological Objectives?

- Highly effective
- Effective
- Somewhat effective
- Ineffective
- Cannot be determined
NAS 3

Conservation Measures
Springflow, Water Quality, Habitat

Biological Objectives
Springflow, Water Quality, Habitat

Biological Goals
Habitat & Population

Will the Conservation Measures achieve the Biological Objectives?
Will the Biological Objectives achieve the Biological Goals?

Conservation Measures: Springflow, Water Quality, Habitat

Biological Objectives: Springflow, Water Quality, Habitat

Biological Goals: Habitat & Population

Likelihood:
- Highly likely
- Likely
- Somewhat likely
- Unlikely
Fountain darter

Conservation Measures (M&M)
- Flow
- Water quality
- Habitat

Biological Objectives
- Minimum flows
- Minimum WQ deviation
- SAV restoration

Biological Goals
- SAV coverage
- Darter density in SAV
“Examination of past performance showed successful removals and plantings of SAV, no obvious drops in fountain darter densities, stable water quality, and a successful adaptive management action demonstrating flexibility in the process.”

- LTBG is reasonable and correctly focused on SAV, but could be improved to be more sensitive to recent trends.
- SAV is key program component with several conservation measures. Need a 1). more sustainable restoration model 2). relaxation of SAV species goals 3). better understanding of factors related to SAV success and 4). recognition of finite capacity available to be restored.
- Stormwater WQ projects are well intended and need to be executed properly – high degree of uncertainty in implementation rates.
Fountain darter – Main Points

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Fountain darter – Improve Rating

- Ways to improve from Likely to Very Likely
  - Demonstrate flows and habitat are reasonable for today and into the future
  - Update the HSI modeling
  - Expand Fountain darter monitoring to restoration reaches
  - Analyze darter data for population abundances that reflect each year
Texas wildrice

Conservation Measures (M&M)
- Flow
- Water quality
- Habitat

Biological Objectives
- Minimum flows
- No water quality objectives
- Acreage during DOR; rec awareness and controls

Biological Goals
- Coverage in 4 reaches
The most persuasive evidence that the objectives will be able to meet the long-term goals is the gain in Texas wild rice coverage in recent years.

- NAS conclusions were offered with “high confidence” given the decades of study and recent expansion in face of severe drought and floods.
- Continued non-native SAV removal is important for success.
- Riparian and recreation management have been successful, but better regulation of the SSA downstream of the dam is needed.
- There are still some questions about relative competition of Texas wild rice versus other native and nonnative species.
Texas wild rice – Main Points

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Texas wildrice – Improve Rating

- Ways to improve from Likely to Very Likely
  - Update the HSI modeling
  - Creating a defined water quality objective, specifically for low flows
  - Adding a habitat objective surrounding removal of nonnatives
San Marcos salamander

Conservation Measures (M&M)
- Flow
- Water quality
- Habitat

Biological Objectives
- Minimum flows
- No water quality objectives
- Riparian protection and recreation control

Biological Goals
- Median populations at 3 locations
- Silt-free gravel and cobble substrates
San Marcos salamander – Main Pts.

“Much of the current scientific information on the species is based on observations and experiments with captive individuals. This lack of information precluded us from assigning a more definitive likelihood”

- No historical abundance estimates, no monitoring for sediment accumulation, lack of biological information.
- No understanding of the effects of nutrients, contaminants, or other environmental stressors on life cycle.
- The dam area is important salamander habitat, regulating the recreation use would be important for this species.
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Ways to improve from Somewhat Likely to Likely

- Analyze salamander data for population abundances that reflect each year.
- Better regulate recreation below the dam.
- Quantify, monitor, and report the extent and outcomes of aquatic gardening and maintenance of silt-free gravel at salamander study reaches.
- Report on the variation associated with salamander density estimates and augment the current sampling protocol to estimate proportion of area occupied and detection probability.
- Generate life history information.
Conservation Measures (M&M)

- Flow
- Water quality
- Habitat

Effective

Biological Objectives

- Minimum spring flows
- Min WQ deviation
- Riparian protection

Somewhat Likely

Biological Goals

- Median lure numbers at 3 areas
- Silt-free gravel and cobble substrates
“This [Biological Goal] determination was based on the fact that there are substantial needs for additional information related to quantitative monitoring of CSRB populations”

- Similar to the SM salamander the goals are difficult to evaluate given the lack of biological evidence available for the species.
- LTBGs should be updated.
- A well designed and articulated approach to calculating annual median densities is needed.
- Unable to set up conservation measures effecting water quality. Not measuring sediment accumulation.
- Riparian measures and silt-free biological objectives.
CSRB – Main Points

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CSRB – Improve Rating

- Ways to improve from Somewhat Likely to Likely

  - Standardize and move towards quantitative sampling of the CSRB in order to better understand populations in monitored reaches.
  - Quantitatively monitor sedimentation in CSRB habitat
  - Conduct habitat suitability modeling to add confidence that flow objectives are protective of the beetle
Will the flow protection measures meet the flow objectives?

- Flow Protection Measures
  - Regional Water Conservation Program
  - Voluntary Irrigation Suspension Program
  - SAWS Aquifer Storage and Recovery and EAA forebearance
  - Critical Period Stage V

- How did NAS arrive at “effective” ranking?
  - Examination of aquifer and springflow response during 2013-2014.
  - Examination of MODFLOW DOR, calibration, and validation simulations.
Will the flow protection measures meet the flow objectives?

  
  “This validation has been conducted, and the model shows general agreement with the well levels and the spring flow observations, but with periods of substantial deviation”

“Underprediction of the indicator well levels and prediction of a slower recovery during wet periods means that the model is conservative – in the sense of protecting the listed species and the spring ecosystems – because it overpredicts the impacts of dry conditions on water levels in the wells.”
Flow Protection Measures - Improve Rating

- EAA efforts on the right track but ways to improve
  - Continue model validation as new periods of drought arise
  - Review results from uncertainty analysis available in 2019
- Flow protection measures could become highly effective if uncertainty analysis shows low error and if the model remains conservative