Evaluating Restoration Success and applying Adaptive Management in the Middle Rio Grande Bosque

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Summary

- Overview of Middle Rio Grande Bosque Restoration Projects
 - Bosque - forested area along the river
- Completed and ongoing monitoring
- 'Adaptive Management' – changes to implementation of restoration based on monitoring results

Bosque Wildfire

- June 2003 – 263 acres burned
- January 2004 – Corps received O&M funds for Bosque Wildfire Project

Middle Rio Grande Bosque Feasibility Study

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1135 Ecosystem Restoration Projects

- 75/25 cost share
- Albuquerque Biological Park Ecosystem Restoration – construction completed October 2005
- Ecosystem Restoration @ RT66 - I-40 south to Bridge Blvd. – construction began January 2009, to be completed April 2010

Ecosystem Revitalization @ Route 66 Project

Why restoration is needed

- Loss of native riparian habitat due to the cumulative effects of agriculture, urban development and flood protection measures (dams, levees, jetty jacks) initiated over the last seven decades resulting in a disruption in the original hydrologic (hydraulic) regime (loss of hydrologic connection between river and 'bosque')
- Presence of non-native vegetation
 - Salt cedar, Russian olive, Siberian elm, Tree of Heaven
- Fire danger due to lack of 'flushing' flows and populations of non-native vegetation

MRG Restoration Projects

- Restoration under various authorities including the following types of work:
 - Thinning of non-native vegetation and dense 'dead and down' material – using various methods
 - Revegetation, creation of wetland habitats, reconnection of hi-flow channels, construction of willow swales

Bosque Restoration

Monitoring Efforts

- Site specific revegetation plans
- Avian surveys
- Measure success of restoration features and techniques:
 - Willow swale restoration study
 - Effects of mulch depth
 - Success of floodplain grassland revegetation methods
 - Use of indicator species
 - Surface water-ground water interactions

Site research and monitoring

- Prior to construction – soils and groundwater testing
- Development of site-specific revegetation plans
 - Goals: increase vegetative diversity (landscape mosaic) while decreasing fire danger
- Information used for comparison in post-construction monitoring

Development of Revegetation Plan using site data (Parametrix)

Avian surveys

- Avian surveys of restoration areas before construction – raptors, tree and ground nesting (no work occurs May 1-August 30)
 - Stayed 3-500 feet away from observed nests
 - Continued monitoring nests
- Long-term monitoring 2004-2009
 - Song-bird transects
 - Raptor surveys
 - In different types of 'treated' areas

(Hawks Aloft Inc.)

Avian Survey Results

- Initial decrease in bird density after thinning (due to understory thinning);
- Density and richness increases in successive years;
- Increase in richness in areas where wet habitat created

Willow Restoration

- Construction sequence
- Six pilot projects implemented in 2005
- Monitoring indicates variable results.
- More rigorous research design to guide future design and adaptive management.

Willow swale construction

Willow Swale Restoration Study

- Evaluate vegetation, soil and groundwater characteristics associated with “successful” and “unsuccessful” willow wetland projects.

- Evaluate differences in soil fertility and ground-dwelling arthropod diversity in constructed willow wetlands compared to adjacent “unrestored” sites and natural willow bars.

(Parametrix)

Mulch Depth Study

- Thick mulch left behind
 - Very few herbaceous plants in sites with thick mulch
- Need data to guide future management
- Original specifications < 4 inches
- Mulch impacts on plant species establishment

(Parametrix)

Mulch Depth Study Results

- Clear relationship between mulch depth and species richness
- When mulch depth $< 5\text{cm}$
 - Up to 4 native grass and 4 native forb spp.
- When mulch depth $\geq 5\text{cm}$
 - Never greater than 2 native spp.
- Implies mulch depth should not exceed approx. 5 cm if want to establish native species via seeding or natural recruitment.
- If more concerned with weed control, then $> 5\text{cm}$ may be desirable.

Floodplain Grassland Revegetation Research

- Native grasses seeded in 2005 following fuels reduction work.
- Monitoring indicates poor seeded grass establishment.
- Observations indicate more site prep needed to facilitate grass establishment.

Grassland Research Design

Evaluating site preparation methods to:

- Improve soil-seed contact
- Reduce establishment of non-native kochia (*Bassia scoparia*)
- Improve native grass establishment & aerial cover.

Field observations indicate excellent grass establishment in sites where soil was "turned over" prior to seeding.

(Parametrix)

Indicator Species Study

- **Pilot Study for Evaluation Ecosystem Restoration Success with use of Indicator Species**
- **Vegetation, ground arthropods, butterflies, avian species**

(DB Stephens – Jean-Luc Cartron)

Indicator Species results (2004-2008)

- Low diversity of ground arthropods
- Sixteen species of butterflies detected each year
- Nineteen nesting avian species (species w/ multiple nests, i.e. BCHU)
- Potential indicator species: Myiitta crescent, green bird, grasshopper, common avian species: BCHU, BH grosbeak, spotted towhee, yellow-breasted chat, possibly eastern bluebird
- Continue monitoring to collect additional information on identified indicator species and weeds
- Monitoring ongoing

Surface water-ground water interaction studies

- Location: Albuquerque BioPark Project
- Develop an understanding of the hydraulic connection between the river, ground water, wetlands, and bosque soil moisture
- Ground water well clusters installed; detailed soils analysis near each well has been conducted.

(University of New Mexico)

Biopark Wetland Complex **Groundwater Table, Pond, and River Surface Elevation** **Septmeber 17, 2008 - June 19, 2009: 15-Minute Time Intervals**

*Baseline data from the Albuquerque Biopark Wetland Complex (BWC) well clusters, pond gauge and river. The color scheme moves from warm to cool as the water levels rise in elevation.

*The pond gauge started recording on 10/22/2008.

*The spike in early October 2008 was the result of a rain event. The USGS Central Bridge gauge recorded 3.53 cm of precipitation in a 12-hour period starting around 1830 hrs on 10/4 and ending around 0630 hrs on 10/5.

*USGS river data are provisional.

The analysis of the surface/ground water interaction will lead to adaptive management strategies of existing projects and design of future projects.

Adaptive Management based on monitoring

- Avian Survey results – more selective thinning in order to leave understory habitat (some non-natives) and phasing of removal to allow new vegetation to move into understory; mid-canopy revegetation
- Mulch depth study – contract requirements for < 5 cm of mulch (also doing follow-up observation on weed suppression)
- Indicator species – some types of restoration and habitat creation beneficial to different species, which ones specifically for MRG Bosque still under study
- Surface water-ground water interaction – Good connection between river and shallow ground water, variable connection between wetlands and the river. More study needed.

Adaptive Management based on monitoring

- Overall goal is to protect and provide habitat for wildlife while balancing with human needs (fire risk reduction, recreation, etc.)
- Implementation of restoration needs to be conducted while protecting species
- Careful planning, phasing, and monitoring to continue 'adaptively managing' restoration process on the ground is key