

**Arizona Water Protection Fund
Application Cover Page
FY 2023**

WPF2302

| Title of Project: Becker Lake Wildlife Area: Little Colorado River Habitat Improvement Project | | | | | | | | | | | |
|---|--|---------------------------------------|---------------------|--------------|-----------|--------------------------------------|----------|----|--|-------------------------|--|
| Type of Project: <input checked="" type="checkbox"/> Capital or Other <input type="checkbox"/> Water Conservation <input type="checkbox"/> Research | Stream Type: <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Ephemeral | | | | | | | | | | |
| Your level of commitment to maintenance of project benefits and capital improvements: <input type="checkbox"/> < 5 years <input type="checkbox"/> 5-10 years <input type="checkbox"/> 11-15 years <input checked="" type="checkbox"/> 16-20 years | | | | | | | | | | | |
| Applicant Information: Name/Organization: Arizona Game & Fish Department Address 1: 5000 W. Carefree Highway Address 2: City: Phoenix State: Arizona ZIP Code: 85086 Phone: (623) 236-7509 Fax: Tax ID No.: XXXXXXXXXX | | | | | | | | | | | |
| Inside an AMA: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> If yes, which AMA: <input type="checkbox"/> Phoenix <input type="checkbox"/> Tucson <input type="checkbox"/> Prescott <input type="checkbox"/> Pinal <input type="checkbox"/> Santa Cruz | | | | | | | | | | | |
| Type of Application: <input checked="" type="checkbox"/> New <input type="checkbox"/> Continuation | | | | | | | | | | | |
| Contact Person: Name: Skyler Hedden Title: Colorado River Basin Coordinator Phone: (623) 236-7509 Fax: e-mail: shedden@azgfd.gov | | | | | | | | | | | |
| Any Previous AWPf Grants: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If yes, please provide Grant #(s): 99-092WPF | | | | | | | | | | | |
| Arizona Water Protection Fund Grant Amount Requested: \$388,075.00 If the application is funded, will the Grantee intend to request an advance: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | Matching Funds Obtained and Secured: <table style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;"><u>Applicant/Agency/Organization:</u></th> <th style="text-align: right;"><u>Amount (\$):</u></th> </tr> </thead> <tbody> <tr> <td>1. Applicant</td> <td style="text-align: right;">23,470.20</td> </tr> <tr> <td>2. Oxbow Ecological Engineering, LLC</td> <td style="text-align: right;">6,629.35</td> </tr> <tr> <td>3.</td> <td></td> </tr> <tr> <td align="right" colspan="2">Total: 30,099.55</td> </tr> </tbody> </table> | <u>Applicant/Agency/Organization:</u> | <u>Amount (\$):</u> | 1. Applicant | 23,470.20 | 2. Oxbow Ecological Engineering, LLC | 6,629.35 | 3. | | Total: 30,099.55 | |
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| 3. | | | | | | | | | | | |
| Total: 30,099.55 | | | | | | | | | | | |
| Has your legal counsel or contracting authority reviewed and accepted the Grant Award Contract General Provisions? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | | | | | | | | | | | |
| Signature of the undersigned certifies understanding and compliance with all terms, conditions and specifications in the attached application. Additionally, signature certifies that all information provided by the applicant is true and accurate. The undersigned acknowledges that intentional presentation of any false or fraudulent information, or knowingly concealing a material fact regarding this application is subject to criminal penalties as provided in A.R.S. Title 13. The Arizona Water Protection Fund Commission may approve Grant Awards with modifications to scope items, methodology, schedule, final products and/or budget. | | | | | | | | | | | |
| Skyler Hedden | Colorado River Basin Coordinator (623) 236-7509 | | | | | | | | | | |
| Typed Name of Applicant or Applicant's Authorized Representative | Title and Telephone Number | | | | | | | | | | |
| | | | | | | | | | | | |
| Signature | Date Signed 8/24/2022 | | | | | | | | | | |

Becker Lake Wildlife Area: Little Colorado River Habitat Improvement Project Executive Summary

The Arizona Game & Fish Department (AGFD) is undertaking a project to improve wildlife habitat and riverscape function along a 1.2-mile corridor of the Little Colorado River (LCR) through Becker Lake Wildlife Area (BLWA). Since 2019 the Arizona Game & Fish Department and project partners have invested over \$55,000 toward the completion of assessment, design, and compliance tasks for the project. With the project currently “shovel ready”, AGFD is seeking funding from AWPf to implement construction and monitoring activities and take the project through to the finish line.

We feel the on-the-ground capital improvement components of the project dovetail with AGFD management goals for the wildlife area, best management practice (BMP) strategies to reduce sediment loading to the Little Colorado River outlined ADEQ’s TMDL report for the area, and the overall goals of the Arizona Water Protection Fund program. The ***Becker Lake Wildlife Area - Little Colorado River Habitat Improvement Project***:

- Demonstrates direct benefits to a perennial rivers
- Demonstrates commitment to continued maintenance of proposed enhancements
- Protects/Restores native riparian vegetation and habitat
- Restores proper hydrologic conditions/functions
- Restores proper stream geomorphology/channel characteristics
- Restores floodplains
- Restores wetlands/backwater areas
- Improves watershed conditions using near-stream restoration treatments that improve water quality or increase water quantity
- Protect/Restores habitat needs for fish and wildlife

The following are restoration practices that will be utilized to meet project goals:

- Floodplain/Backwater Connection, Re-contouring, and Enhancement - Reconnect, re-contour, and enhance 2.45-acres of relic floodplain channels to help distribute and attenuate frequent flood flows (\pm 2-year events) over 15.7-acres of riparian meadow floodplain. Reconnect the river to these floodplain features by excavating 5,400 cubic yards of soil to create wide, shallow swales to provide flood relief and spread and slow flows while also reducing shear stress on streambanks during frequent floods. Shape existing relic channels and strategically place woody debris to increase habitat complexity and roughness.
- River Walk Trail Improvements - Strategically relocate and improve 2,760 feet of the river walk trail to provide an additional 4.7-acre riparian buffer for natural river processes, beaver and other wildlife activity, and agricultural activities. Create an elevated, multi-course, compacted trail prism, with weed barrier underlay, to improve drainage and surface conditions and reduce maintenance. Decommission abandoned sections of trail as required, and salvage/re-use drainage culverts.
- Streambank Soil Bioengineering - Construct a 180-foot-long floodplain bench at the outside of a severely eroded meander bend near the parking area to reduce bank erosion potential, add flood relief, and create a stable platform for dense riparian and wetland plantings. Strategically embed graded rock and boulders within the bench and toe of slope to add erosion protection and protect native plantings.
- Native Revegetation: Riparian Sod & Willow Clump Transplants - Harvest and strategically plant a mosaic of native wetland and riparian vegetation, including 2.45 acres of riparian sodmat and 290 willow clumps, to provide soil stabilization, cover, and habitat. Augment with 0.5-acres of native seed and mulch.

Applications: Becker Lake Wildlife Area: Little Colorado River Habitat Improvement Project

Profile

shedden@azgfd.gov

Project Title

Becker Lake Wildlife Area: Little Colorado River Habitat Improvement Project

Organization Name

Arizona Game and Fish Department

Application Cover Page

1.1 Application Cover Page Form.pdf

Executive Summary

2.1 Executive Summary.docx

Project Overview

3.1 Project Overview.docx

Project Location and Environmental Contaminant Information

4.1 Project Location & Environmental Contaminant Information Form.docx

Scope of Work

5.1 Scope of Work.docx

AWPF Detailed Budget

6.1 Detailed Budget Breakdown.xlsx

Matching / Cost Share Budget

7.1 Detailed Matching Funds Breakdown.xlsx

Arizona Watershed Map

8.1 Arizona Watershed Map.docx

Project Location: Schematic Maps

8.2 Project Location - Schematic Map (Excerpt from Construction Drawings).pdf

Project Location: Schematic Maps (cont.)

Project Location: Ownership Maps

8.3 Project Location - Ownership Map.pdf

Project Location: Ownership Maps (cont.)

State Historic Preservation Office (SHPO) Review Forms

9.1 State Historic Preservation Office (SHPO) Review Forms.pdf

State Historic Preservation Office (SHPO) Review Forms (cont.)

9.2 USGS Quad Map.pdf

State Historic Preservation Office (SHPO) Review Forms (cont.)

9.3 Cultural Resources Survey Report.pdf

State Historic Preservation Office (SHPO) Review Forms (cont.)

9.4 SHPO Consultation & Concurrence.pdf

State Historic Preservation Office (SHPO) Review Forms (cont.)

Key Personnel

Key Personnel Briefings - Personnel Marked with an (*) have supplemental detailed resume/CV's files attached:

*Skyler Hedden (AWPF Grant Project Coordinator/Colorado River Basin Coordinator - Arizona Game & Fish Department) - Skyler is a biologist and the Colorado River Basin Native Aquatic Coordinator for Arizona Game and Fish. He has over 10 years of experience working in aquatic systems, primarily focused on fish, macroinvertebrates, and fluvial stream morphology. Skyler has been managing all phases of the Becker Lake Wildlife Area Little Colorado Habitat Improvement Project since 2021 and has played a crucial role in securing funding for assessment, design, and compliance phases of the project. He will act as the Project Coordinator for the implementation and monitoring of the project if AWPF grant funds are secured.

*George Cathey (Project Engineer - Oxbow Ecological Engineering, LLC): George is the owner, principal engineer, & Certified Ecological Restoration Practitioner (CERP) at Oxbow Ecological Engineering, LLC. George has over nineteen years of experience working as an engineer specializing in ecological restoration, and has significant experience surveying, designing, bidding, and administering construction activities on both small and large-scale restoration projects. Over the years, he has collaborated with a diverse group of restoration stakeholders including non-profit organizations, volunteers, landowners, A/E firms, and construction contractors as well as local, state, federal, & tribal agencies. George has been working with AGFD on the development of the Becker Lake Wildlife Area Little Colorado Habitat Improvement Project since 2019 and has provided grant assistance, project planning, survey, assessment, design, and compliance services as part of the project. He also donated funds required to complete a cultural resource survey for the project to help get it "shovel ready". George will continue his collaboration with AGFD and will provide construction administration and monitoring services as part of the implementation phase.

David Dorum (Habitat, Evaluation, and Lands Program Manager - Arizona Game & Fish Department): Bachelor of Science in Wildlife Biology from Arizona State University, 1990. David has over 31 years of experience with the Arizona Game and Fish Department, and currently is the Habitat, Evaluation, and Lands Program Manager for Region I. David has been working on the Becker Lake Wildlife Area Little Colorado Habitat Improvement Project since 2019 and has helped guide the project vision based off operational management plans for the area. David will continue his collaboration and guidance on the project through the implementation and monitoring phase if AWPF grant funds are secured.

Key Personnel (cont.)

10.1 Key Personnel - Detailed Resumes.pdf

Project Site Photographs

11.1 Project Site Photos & Video.docx

Project Implementation Plans

1.) Implementation Plans: Becker Lake Wildlife Area Little Colorado River Habitat Improvement Project - Final Construction Drawings and Technical Specifications (See Attached) - These detailed contract documents, sealed by and Arizona Professional Engineer, provided detailed prescriptions for building the entire habitat improvement project. The construction drawings are a visual representation showing the character and scope of work to be performed, to complement the construction specifications. The drawings include location, profiles, sections, details, and notes necessary to describe the work. The technical specifications are written requirements for materials, equipment, systems, standards, and workmanship as applied to the work. They also describe certain administrative requirements and procedural matters including methods of measurement and basis of payment.

2.) Monitoring Plans (see Scope of Work, Task#4): Monitoring provides the critical information that will be evaluated to determine whether adjustments are necessary to mitigate risk or damage, to conduct structure maintenance, to implement the next phase of restoration, if the system is self-sustaining, or if project and reach phase specific objectives have been met. Prior to construction, a monitoring plan will be developed that includes the survey design (where, when, and how many sites), and the response design (what indicators and how to measure them). The following are some provisional monitoring information that may be collected in order to evaluate whether target objectives are being met (this will be refined as part of the monitoring plan development).

2.1 General Monitoring: Collect baseline and post-construction monitoring photos at established monumented points. Augment with georeferenced drone orthoimagery.

2.2 Objective 1 Monitoring - Reconnect, re-contour, and enhance a series of relic floodplain channels and near stream wetland backwaters

2.2.1 Measure flood frequency/floodplain activity: Establish shallow piezometer/monitoring wells with water level data loggers to constantly measure changes in water level within the floodplain channels and backwaters. Establish long-term timelapse cameras at strategic points in floodplain channels to supplement water level data.

2.2.2 Measure wetted/inundated area - Utilize RGB drone orthoimagery and/or drone multi-spectral imagery to measure to estimate wetland vegetation response, supplemented with on the ground observations.

2.3 Objective 2 Monitoring - Strategically relocate and improve the river walk trail

2.3.1 Measure channel/bank migration within new buffer area- utilize drone orthoimagery and/or photogrammetry data to monitor changes in river dimension and pattern, supplemented with on the ground observations.

2.3.2 Measure beaver activity - utilize drone orthoimagery to quantify active/inactive beaver dam complexes.

2.4 Objective 3 Monitoring - Decrease the Bank Erosion Potential (BEP) of cut-banks

2.4.1 Measure Bank Erosion Potential (BEP) and/or Bank Erosion Hazard Index (BEHI)

2.4.2 Measure bank cross-sections using survey grade GPS

2.5 Objective 4 Monitoring - Establish native plant species found naturally in the watershed

2.5.1 Measure native planting success: On the ground vegetation transects augmented with RGB drone orthoimagery and/or drone multi-spectral imagery to estimate vegetation response.

2.6 Objective 5 Monitoring - Improve agricultural tailwater ditches

2.6.1 Monitor use and system function - coordinate with AGFD land managers to monitor frequency/amount of irrigation events on working lands and system response.

3.) Becker Lake Wildlife Area Operational Management Plan (See Attached): The purpose of this operational plan is to provide management direction and budget needs for the operation and maintenance of the Becker Lake Wildlife Area (BLWA).

Existing Plans / Reports / Information

12.1 Final Construction Drawings & Technical Specifications.pdf

Existing Plans / Reports / Information (cont.)

12.2 Becker Lake Wildlife Area Operational Management Plan.pdf

Existing Plans / Reports / Information (cont.)

Additional environmental compliance permit and report documents are located in the "Additional Project Information" section

Letters of Community Support

13.1 Letters of Support.pdf

Letters from Entities Pledging Matching Funds

14.1 Letters from Entities Pledging Matching Funds.pdf

Evidence of Control and Tenure of Land

15.1 Evidence of Control and Tenure of Land - Warranty Deed - Enders (2002).pdf

Evidence of Control and Tenure of Land (cont.)

15.2 Evidence of Control and Tenure of Land - Warranty Deed - Becker (1974).pdf

Project Site Access / Permission to Conduct Work

The Becker Lake Wildlife Area property is owned by the Arizona Game and Fish Commission and the Arizona Game and Fish Department has legal and physical access and authority to manage the area where grant tasks are to be performed.

Evidence of Physical and Legal Availability of Water

16.1 Evidence of Physical and Legal Availability of Water.pdf

Evidence of Physical and Legal Availability of Water (cont.)**OPTIONAL: Additional Project Information**

- 1.) Arizona Department of Environmental Quality (ADEQ) Environmental Compliance Documents: Little Colorado River TMDL Turbidity Report; Notice of Intent /AZPDES Stormwater Construction General Permit (CGP); Clean Water Act § 401 Water Quality Certification
- 2.) Arizona Game and Fish (AGFD) Environmental Compliance Documents: Environmental Assessment Checklist (EAC)
- 3.) US Army Corps of Engineers (USACE) Environmental Compliance Documents: Preliminary Jurisdictional Delineation (PJD)

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17.1 ADEQ Environmental Compliance Documents.pdf

OPTIONAL: Additional Project Information

17.2 AGFD Environmental Compliance Documents.pdf

OPTIONAL: Additional Project Information

17.3 USACE Environmental Compliance Documents.pdf

View Budget Worksheet**View Application Goals**

<https://portal.ecivis.com/#/peerGoals/CF96A87E-4BD6-46EB-8DA8-02BD008C0430>

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17.3 USACE Environmental Compliance Documents.pdf

Becker Lake Wildlife Area: Little Colorado River Habitat Improvement Project Project Overview

Background

The Arizona Game & Fish Department (AGFD) is undertaking a project to improve wildlife habitat and riverscape function along a 1.2-mile corridor of the Little Colorado River (LCR) through Becker Lake Wildlife Area (BLWA). Since 2019 the Arizona Game & Fish Department and project partners have invested over \$55,000 toward the completion of assessment, design, and compliance tasks for the project. With the project currently “shovel ready”, AGFD is seeking funding from AWPf to implement construction and monitoring activities and take the project through to the finish line.

BLWA consists of approximately 634 acres of Arizona Game and Fish Commission deeded lands located within the town limits of Springerville in Apache County. The wildlife area provides a variety of habitat including: over a mile of LCR stream-side habitat, 120 acres of wet meadow, over five acres of stream riparian habitat, an 85-acre lake, and a plains grassland community on the uplands.

The goals of the Arizona Game & Fish Department’s management effort at BLWA are to conserve and enhance aquatic and riparian habitat values for the management of multiple federally-listed species and other Species of Greatest Conservation Need (SGCN) and provide the public with a quality recreational experience. We feel the on the ground capital improvement components of the **Becker Lake Wildlife Area - Little Colorado River Habitat Improvement Project** dovetail with AGFD management goals for the wildlife area, best management practice (BMP) strategies to reduce sediment loading to the Little Colorado River outlined ADEQ’s TMDL report for the area, and the overall goals of the Arizona Water Protection Fund program.

Goals

The 47.5-acre project area includes a 6,400-foot long corridor of connected floodplain and channel habitats. Collectively, these floodplain and channel habitats make up the Little Colorado River “riverscape”. The overall goal of the project is to improve morphological and ecological diversity of the LCR riverscape through Becker Lake Wildlife Area and help build a resilient and sustaining system that directly benefits stream and floodplain function, habitat for fish and wildlife, recreational opportunities for the public, and efficiency of working lands.

Objectives

1. Reconnect, re-contour, and enhance a series of relic floodplain channels and near stream wetland backwaters to increase the frequency of out-of-bank flows, spread and slow these frequent flood flows (\pm 2-year events), and consequently relieve pressure on streambanks throughout the river corridor. Ancillary benefits of this work include an increased area of inundation and expanded near stream wetland and backwater habitat.
2. Strategically relocate and improve the river walk trail to increase the riparian buffer and allow room for natural river processes, beaver activity, and agriculture operations to play out, while maintaining public access, viewing opportunities, and reducing maintenance.
3. Decrease the Bank Erosion Potential (BEP) of cut-banks to reduce non-point source sediment pollution and enhance aquatic habitat diversity.
4. Establish native plant species found naturally in the watershed to increase the area of wetland and riparian habitat.
5. Improve agricultural tailwater ditches to prevent trail flooding and allow for more efficient irrigation of AGFD working lands.

Statement of Problems/Causes

The following is a riverscape assessment briefing of the ~6,400-foot-long study reach of the Lower Colorado River through BLWA that outlines some of the problems/causes in the project area:

- The river currently traverses the eastern edge of a wide, undeveloped meadow complex. The meadow has a series of relic channels directly adjacent to the river that have been abandoned due to river incision.
- Multiple meander banks within this stream channel reach have raw vertical/overhanging banks and partially formed lateral scour pools. The height of these banks relative to bankfull depth

combined with steep bank angles, little or no root density or bank protection, and stratified bank soils creates a high potential for further bank erosion. Without intervention/stabilization efforts to address these impairments, these banks could become a significant source of non-point source sediment pollution.

- Beaver activity is evident within the river corridor, with multiple large dam complexes throughout the site. These complexes provide multiple important ecosystems services including: fish refugia, increased aquatic habitat heterogeneity, increased lateral connectivity to the floodplain, and increased area of inundation for groundwater water recharge and riparian vegetation health. The presence of the beaver and the ecological services they provide have been considered and integrated into this habitat improvement plan.
- During the assessment, the agricultural field/working lands on the east side of the river were being flood irrigated and most of the tailwater was being routed directly to the river via a culvert. Along with erosion at the culvert outlet, the tailwater had breached the ditch adjacent to the field and was flooding the trail and causing an active headcut to form on the trail edge/streambank interface.
- The popular "River Walk Trail" that closely parallels the banks of the Little Colorado River through Becker Lake Wildlife Area provides access and viewing opportunities to the public. Currently there are multiple trail locations that have been damaged by natural river processes, agricultural runoff, and beaver activity.
- There is relatively low density of riparian vegetation present within the corridor, other than a few patches of coyote willow and narrowleaf cottonwood planted in a previous restoration project in 2002/2006. This lack of native vegetation has likely contributed to accelerated bank erosion and channel incision.

Statement of Solutions

Based on the inventory and habitat assessment for the project, the restoration team developed a set of site-specific practices that, if implemented holistically, could be used to meet the project goals and objectives. The following are restoration practices that will be utilized to meet project objectives (see attached "Final Construction Drawings and Technical Specifications" for detailed plans and quantities).

- Floodplain/Backwater Connection, Re-contouring, and Enhancement - Reconnect, re-contour, and enhance 2.45-acres of relic floodplain channels to help distribute and attenuate frequent flood flows (\pm 2-year events) over 15.7-acres of riparian meadow floodplain. Reconnect the river to these floodplain features by excavating 5,400 cubic yards of soil to create wide, shallow swales to provide flood relief and spread and slow flows while also reducing shear stress on streambanks during frequent floods. Shape existing relic channels and strategically place woody debris to increase habitat complexity and roughness.
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- Native Revegetation: Riparian Sod & Willow Clump Transplants - Harvest and strategically plant a mosaic of native wetland and riparian vegetation, including 2.45 acres of riparian sodmat and 290 willow clumps, to provide soil stabilization, cover, and habitat. Augment with 0.5-acres of native seed and mulch.

Statement of Project Years of Benefit to the Resource and General Public

Following successful implementation of this project and reestablishment of native vegetation the benefits of this project should continue to be realized in excess of 20 years. While the project has been designed to require little if any maintenance, AGFD has a vested interest in ensuring the riparian and meadow habitats are maintained and functioning following this and all improvement projects. AGFD has already shown its commitment to monitoring and managing for high-quality wildlife habitat on the Becker Lake Wildlife Area property.

Project Location & Environmental Contaminant Information FY 2023

| Project Location Information | | | |
|--|-----------------------------------|------------------------|----------------------|
| 1. County: <u>Apache</u> | 2. Section(s): <u>29 & 32</u> | 3. Township: <u>9N</u> | 4. Range: <u>29E</u> |
| <p>5. Watershed: <u>South Fork Little Colorado River-Little Colorado River</u></p> <p>6. 8 or 10 Digit Hydrologic Unit Code (HUC): <u>1502000102</u></p> <p>7. Name of USGS Topographic Map where project area is located: <u>Springerville</u></p> <p>8. State Legislative District: <u>07</u></p> <p style="padding-left: 20px;">(Information available at: https://azredistricting.org/districtlocator/)</p> <p>9. Land ownership of project area: <u>Arizona Game and Fish Comission</u></p> <p>10. Current land use of project area: <u>Wildlife/habitat conservation & wildlife viewing</u></p> <p>11. Size of project area (in acres): <u>47.5 acres</u></p> <p>12. Stream Name: <u>Little Colorado River</u></p> <p>13. Length of stream through project area: <u>1.1 miles</u></p> <p>14. Miles of stream benefited: <u>1.1 miles</u></p> <p>15. Acres of riparian habitat: <u>20.6 acres</u> will be:</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Enhanced: 15.7 acres of reconnected riparian meadow floodplain and backwater wetlands <input type="checkbox"/> Maintained <input checked="" type="checkbox"/> Restored: 0.2 acres of riparian streambank bioengineering & native riparian plantings <input checked="" type="checkbox"/> Created: 4.7 acres of additional riparian trail buffer | | | |
| <p>16. General description and/or delineation for the area of impact of the project within the watershed. <u>The project area encompasses a 1.1-mile reach of the Little Colorado River (LCR), located 0.6 miles upstream of the Nutrioso Creek confluence. The LCR within the project area has a contributing watershed area of 152 mi². This river reach [Water Canyon to Nutrioso Creek (WBID: 15020001-010)] is listed as “impaired” for turbidity by ADEQ and project objectives dovetail with best management practice (BMP) strategies to reduce non-point source sediment loading to the Little Colorado River outlined in the associated 2002 TMDL report.</u></p> | | | |
| <p>17. Provide directions to the project site from the nearest city or town. List any special access requirements: <u>From Springerville, proceed northwest on Highway 191 for approximately 1-mile, then turn left (west) into the Becker Lake Wildlife Area River Walk trailhead parking lot.</u></p> | | | |
| Environmental Contaminant Location Information | | | |
| <p>1. Does your project site contain known environmental contaminants? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO If yes, please identify the contaminant(s) and enclose data about the location and levels of contaminants:</p> <p>2. Are there known environmental contaminants in the project vicinity? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO If yes, please identify the contaminant(s) and enclose data about the location and levels of contaminants:</p> <p>3. Are you asking for Arizona Water Protection Fund monies to identify whether or not environmental contaminants are present? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO</p> | | | |

Becker Lake Wildlife Area: Little Colorado River Habitat Improvement Project Scope of Work

Task 1: Submit Completed Permits/Implementation Plans and Secure Subcontractor Agreements

Task Description: AGFD has obtained all necessary environmental and cultural compliance permits and concurrences for the project. In addition, AGFD/OEE have completed final construction drawings and specifications that will guide implementation. Prior to initiating any ground disturbing activities, AGFD will provide copies of all permits/implementation plans to the Project Manager. Permits/concurrences and implementation plans include:

- Arizona Department of Environmental Quality (ADEQ) Environmental Compliance Documents: Notice of Intent /AZPDES Stormwater Construction General Permit (CGP); Approved Stormwater Pollution Prevention Plan (SWPPP); Approved Sampling and Analysis Plan (SAP); Clean Water Act § 401 Water Quality Certification
- Arizona Game and Fish (AGFD) Environmental Compliance Documents: Environmental Assessment Checklist (EAC); Cultural Resource Survey and State Historic Preservation Office (SHPO) Consultation; Section 7 Biological Evaluation Form
- US Army Corps of Engineers (USACE) Environmental Compliance Documents: Preliminary Jurisdictional Delineation (PJD)
- Becker Lake Wildlife Area Little Colorado River Habitat Improvement Project - Final Construction Drawings and Technical Specifications

Prior to commencing Task #2, Task#4, and Task#5, AGFD will execute a subcontractor agreement with Oxbow Ecological Engineering, LLC (OEE) who is an AGFD on-call consultant for “Aquatic Habitat Assessment and Restoration Services”.

Prior to commencing Task#3, AGFD will negotiate and execute a subcontractor agreement with a qualified construction contractor on the AGFD on-call/JOC contractor list.

Task Purpose/Objective: To comply with all local, state, and federal permit requirements and provide relevant implementation plans and sub-contractor agreements.

Responsible Personnel: Skyler Hedden (Project Coordinator - AGFD)

Deliverable Description/Due Date:

- Copies of all approved permits, implementation plans, and agreements: Delivered prior to any ground disturbing activities

Task Cost: \$0

Task 2: Implement Habitat Improvement Plan – Construction Administration

Task Description: Oxbow Ecological Engineering, LLC (OEE) will provide comprehensive construction phase administration services including:

- Coordinate & attend a pre-construction meeting and site walk with the AGFD hired contractor and AGFD personnel to lay the foundation for a smooth construction process. The meeting will provide an opportunity to discuss the plans and specifications, site issues and scheduling, site layout, the duties and roles of project team members, and various communication and coordination processes—including handling requests for information (RFI) and change orders.
- Provide additional pre-construction coordination and correspondence with the AGFD hired contractors and AGFD personnel, including transfer of electronic design data, review of material submittals, responses to pre-construction Request for Information (RFI), and site staking/layout.
- Attend on-site “tailgate” coordination meetings with the AGFD hired contractors and AGFD personnel, as required, to discuss construction progress, schedule, and benchmarks.
- Provide site observation services at intervals appropriate for the stage of construction. OEE will observe and keep AGFD informed of progress and quality of work, determine if work is in substantial conformance with the construction drawings and specifications, and endeavor to

guard AGFD against defective work. Because of the nature of the work, more frequent site visits may be required during the first weeks of constructions, to ensure that the AGFD contractor have real-time responses to RFI's and to aid with plan interpretation and/or field adjustments during initial construction of habitat improvement features. Bi-weekly construction observation services may be sufficient after the first few weeks of construction. As required, OEE will provide additional on-call construction observation services. Project Status Reports will be provided at regular intervals that describe progress, anticipated accomplishments, scope & schedule status, and site photos.

- Provide Stormwater Pollution Prevention Plan (SWPPP) inspection services including completing necessary field forms and water sampling and analysis.
- Prepare, reproduce, and distribute supplemental Drawings, Specifications, and Interpretations in response to Requests for Information (RFI), from the AGFD hired contractor.
- Prepare "Record Drawings" that compile site changes known to OEE and information provided by the contractor.

Task Purpose/Objective: Provide construction administration services to effectively support AGFD's project objectives and interests, address questions and problems as they arise, and provide oversight of the construction contract during pre-construction and construction phases of the work.

Responsible Personnel: George Cathey, PE, CERP (Project Engineer - OEE)

Deliverable Description/Due Date:

- Project Status Report: Delivered every 7-14 days once construction commences
- Record Drawings: Delivered within 30 days of project completion

Task Cost: \$19,000

Task 3: Implement Habitat Improvement Plan – Project Construction

Task Description: Construct the on-the-the ground habitat improvements outlined in the construction drawings and specifications including all general requirements, earthwork, riverscape structures, and native plantings. AGFD expects to hire one of their qualified on-call/JOC contractors to complete all components of the work, including all labor, materials, tools, equipment, and incidentals.

Task Purpose/Objective: Provide a complete, operating system in satisfactory working condition with respect to the functional purpose of the installation as outlined in construction drawings and specifications.

Responsible Personnel: Arizona Game & Fish Department On-Call/JOC Contractor (TBD)

Deliverable Description/Due Date:

- Construction Schedule: Delivered prior to construction
- Completed Construction: Target Delivery of 2023. Actual completion date will depend on AGFD procurement schedules and on-call/JOC contractor availability.

Task Cost: \$338,675

Task 4: Develop & Implement Monitoring Plan

Task Description:

Monitoring provides the critical information that will be evaluated to determine whether adjustments are necessary to mitigate risk or damage, to conduct structure maintenance, to implement the next phase of restoration, if the system is self-sustaining, or if project and reach phase specific objectives have been met. Prior to construction, a monitoring plan will be developed that includes the survey design (where, when, and how many sites), and the response design (what indicators and how to measure them). The following are some provisional monitoring information that may be collected in order to evaluate whether target objectives are being met (this will be refined as part of the monitoring plan development).

- General Monitoring: Collect baseline and post-construction monitoring photos at established monumented points. Augment with georeferenced drone orthoimagery.

- Objective 1 Monitoring - Reconnect, re-contour, and enhance a series of relic floodplain channels and near stream wetland backwaters
 - Measure flood frequency/floodplain activity: Establish shallow piezometer/monitoring wells with water level data loggers to constantly measure changes in water level within the floodplain channels and backwaters. Establish long-term timelapse cameras at strategic points in floodplain channels to supplement water level data.
 - Measure wetted/inundated area – Utilize RGB drone orthoimagery and/or drone multi-spectral imagery to measure to estimate wetland vegetation response, supplemented with on the ground observations.
- Objective 2 Monitoring - Strategically relocate and improve the river walk trail
 - Measure channel/bank migration within new buffer area– utilize drone orthoimagery and/or photogrammetry data to monitor changes in river dimension and pattern, supplemented with on the ground observations.
 - Measure beaver activity - utilize drone orthoimagery to quantify active/inactive beaver dam complexes.
- Objective 3 Monitoring - Decrease the Bank Erosion Potential (BEP) of cut-banks
 - Measure Bank Erosion Potential (BEP) and/or Bank Erosion Hazard Index (BEHI)
 - Measure bank cross-sections using survey grade GPS
- Objective 4 Monitoring - Establish native plant species found naturally in the watershed
 - Measure native planting success: On the ground vegetation transects augmented with RGB drone orthoimagery and/or drone multi-spectral imagery to estimate vegetation response.
- Objective 5 Monitoring - Improve agricultural tailwater ditches
 - Monitor use and system function – coordinate with AGFD land managers to monitor frequency/amount of irrigation events on working lands and system response.

Task Purpose/Objective: Develop a monitoring plan and implement the plan by measuring the effectiveness of the prescribed treatments in meeting the project objectives.

Responsible Personnel: George Cathey, PE, CERP (Project Engineer - OEE) and Skyler Hedden (Project Coordinator - AGFD)

Deliverable Description/Due Date:

- Monitoring Plan: Delivered prior to Construction
- Baseline Monitoring Report: Target Delivery of 2023
- Annual Monitoring Reports: Target Delivery of 2023, 2024, 2025, 2026

Task Cost: \$26,600

Task 5: Complete Final Report & Presentation

Task Description: Personnel from OEE and AGFD will prepare and submit a final report that includes a summary of all methodologies used, outcome of all tasks, analysis of project and monitoring data, photos of features, suggestions for any further changes needed in the project, and an evaluation of the project's success.

Task Purpose/Objective: Summarize project and outcomes and evaluate success

Responsible Personnel: George Cathey, PE, CERP (Project Engineer - OEE) and Skyler Hedden (Project Coordinator - AGFD)

Deliverable Description/Due Date:

- Final Project Report/Presentation: Target Delivery 2026

Task Cost: \$3,800

| Arizona Water Protection Fund Grant Application Detailed Budget | | | | | | |
|--|---|--------|----------|----------------|-------------|-------------|
| Becker Lake Wildlife Area: Little Colorado River Habitat Improvement Project | | | | | | |
| Task 1: Submit Completed Permits/Implementation Plans and Secure Subcontractor Agreements | | | | | | |
| Item Number | Item Description | Amount | Unit | Unit Cost | Total Cost | |
| No Cost | | | | | | |
| | | | | TASK 1 TOTAL = | | \$0.00 |
| Task 2: Implement Habitat Improvement Plan – Construction Administration | | | | | | |
| Item Number | Item Description | Amount | Unit | Unit Cost | Total Cost | |
| 2.1 | (OEE) Civil Engineer | 200 | HOUR | \$95.00 | \$19,000.00 | |
| | | | | TASK 2 TOTAL = | | \$19,000.00 |
| Task 3: Implement Habitat Improvement Plan – Project Construction | | | | | | |
| Item Number | Item Description | Amount | Unit | Unit Cost | Total Cost | |
| GENERAL | | | | | | |
| 3.1 | Fulfill General Construction Requirements | 1 | LUMP SUM | \$25,000.00 | \$25,000.00 | |
| 3.2 | Mobilize & Demobilize Equipment | 1 | LUMP SUM | \$22,000.00 | \$22,000.00 | |
| EARTHWORK | | | | | | |

Budget (AWPF)

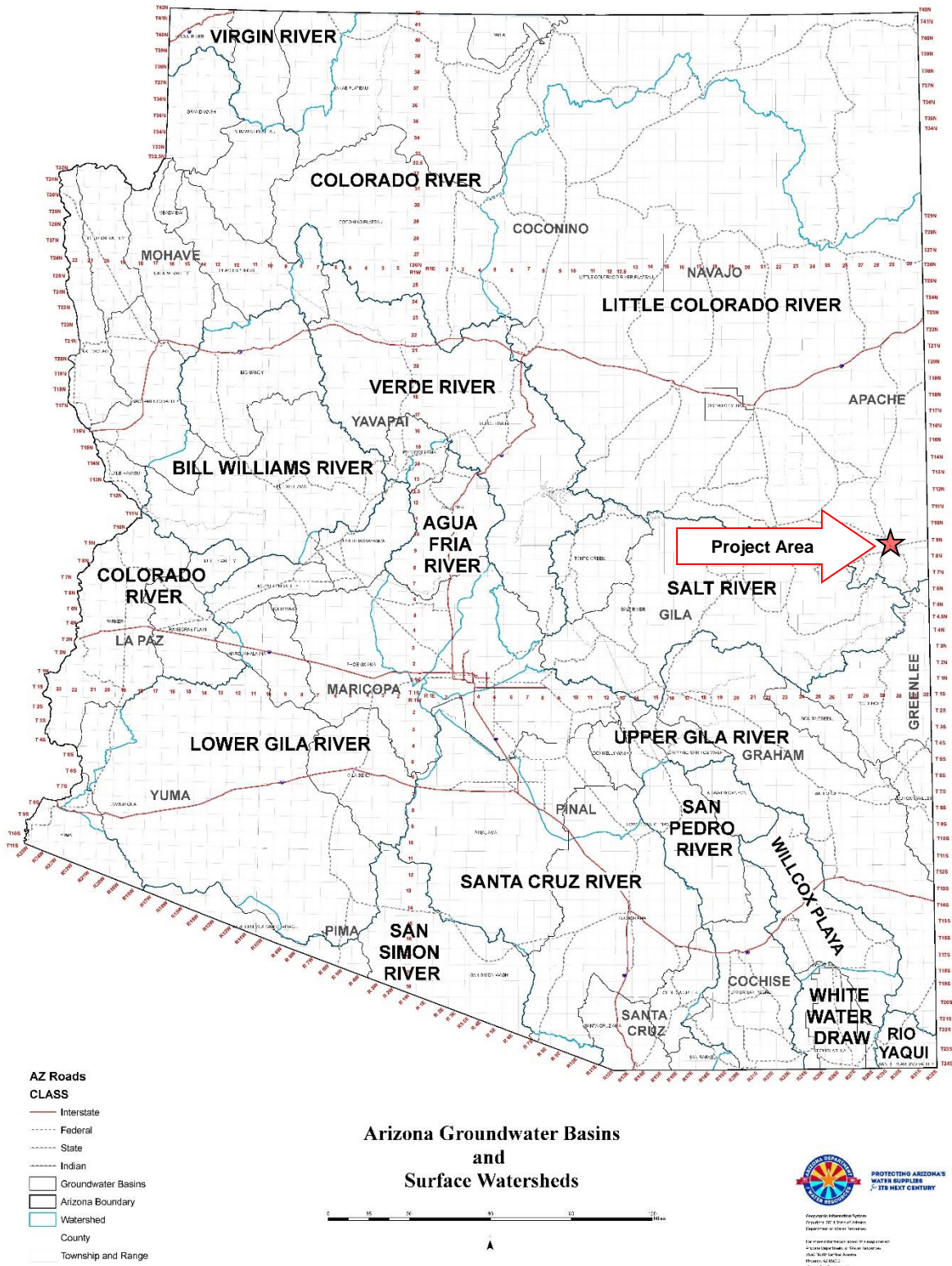
| | | | | | | |
|--|------------------------------|---|-------|-------------|-----------------------|---------------------|
| | 3.3 | Floodplain Swales: Excavate, Shape, Haul, & Place | 4,620 | CUBIC YARDS | \$24.00 | \$110,880.00 |
| | 3.4 | Floodplain Depressions: Excavate, Shape, Haul, & Place | 400 | CUBIC YARDS | \$24.00 | \$9,600.00 |
| | 3.5 | Backwater Channels: Excavate, Shape, Haul, & Place | 380 | CUBIC YARDS | \$24.00 | \$9,120.00 |
| | 3.6 | Streambank Soil Bioengineering: Excavate, Shape, Haul, & Place | 350 | CUBIC YARDS | \$29.00 | \$10,150.00 |
| | 3.7 | Irrigation Ditch: Excavate, Shape, Haul, & Place | 1,010 | LINEAR FEET | \$2.00 | \$2,020.00 |
| | RIVERSCAPE STRUCTURES | | | | | |
| | 3.8 | Streambank Soil Bioengineering: Supply & Construct Toe Protection | 180 | LINEAR FEET | \$100.00 | \$18,000.00 |
| | 3.9 | Boulders: Transport & Install | 1 | LUMP SUM | \$4,000.00 | \$4,000.00 |
| | 3.10 | River Trail: Supply & Construct | 2,760 | LINEAR FEET | \$25.00 | \$69,000.00 |
| | 3.11 | River Trail: Decommission | 2,220 | LINEAR FEET | \$2.00 | \$4,440.00 |
| | 3.12 | Culvert: Salvage, Transport, & Place | 5 | EACH | \$2,000.00 | \$10,000.00 |
| | 3.13 | Woody Debris: Sort, Transport, & Place | 1 | LUMP SUM | \$8,000.00 | \$8,000.00 |
| | NATIVE PLANTINGS | | | | | |
| | 3.14 | Riparian Sodmat: Salvage/Harvest & Transplant | 2.45 | ACRES | \$10,000.00 | \$24,500.00 |
| | 3.15 | Willow Clump: Salvage/Harvest & Transplant | 290 | CLUMPS | \$20.00 | \$5,800.00 |
| | 3.16 | Native Seed: Supply, Broadcast, & Mulch | 0.50 | ACRES | \$12,330.00 | \$6,165.00 |
| | | | | | TASK 3 TOTAL = | \$338,675.00 |
| | | | | | | |

| Task 4: Develop & Implement Monitoring Plan | | | | | | |
|---|-------------------------|---------------|-------------|-----------------------|---|--|
| Item Number | Item Description | Amount | Unit | Unit Cost | Total Cost | |
| 4.1 | (OEE) Civil Engineer | 280 | HOUR | \$95.00 | \$26,600.00 | |
| | | | | TASK 4 TOTAL = | \$26,600.00 | |
| Task 5: Complete Final Report & Presentation | | | | | | |
| Item Number | Item Description | Amount | Unit | Unit Cost | Total Cost | |
| 5.1 | (OEE) Civil Engineer | 40 | HOUR | \$95.00 | \$3,800.00 | |
| | | | | TASK 5 TOTAL = | \$3,800.00 | |
| | | | | | Arizona Water Protection Fund Grant Application Fund Request = | |
| | | | | | \$388,075.00 | |

| Arizona Water Protection Fund Grant Application: Matching Funds / Cost Share Budget | | | | | | |
|--|-----------------------------------|---------------|-------------|-----------------------|-------------------|--|
| Becker Lake Wildlife Area: Little Colorado River Habitat Improvement Project | | | | | | |
| Task 1: Submit Completed Permits/Implementation Plans and Secure Subcontractor Agreements | | | | | | |
| Item Number | Item Description | Amount | Unit | Unit Cost | Total Cost | |
| 1.1 | (AGFD) Colorado Basin Coordinator | 50 | HOUR | \$46.02 | \$2,301.00 | |
| | | | | TASK 1 TOTAL = | \$2,301.00 | |
| Task 2: Implement Habitat Improvement Plan – Construction Administration | | | | | | |
| Item Number | Item Description | Amount | Unit | Unit Cost | Total Cost | |
| 2.1 | (AGFD) Colorado Basin Coordinator | 80 | HOUR | \$46.02 | \$3,681.60 | |
| 2.2 | (OEE) Travel: Mileage | 4,640 | MILES | \$0.445 | \$2,064.80 | |
| 2.3 | (OEE) Travel: Lodging & Per Diem | 16 | DAYS | \$85.00 | \$1,360.00 | |
| | | | | TASK 2 TOTAL = | \$7,106.40 | |
| Task 3: Implement Habitat Improvement Plan – Project Construction | | | | | | |
| Item Number | Item Description | Amount | Unit | Unit Cost | Total Cost | |
| 3.1 | (AGFD) Colorado Basin Coordinator | 40 | HOUR | \$46.02 | \$1,840.80 | |
| | | | | TASK 3 TOTAL = | \$1,840.80 | |

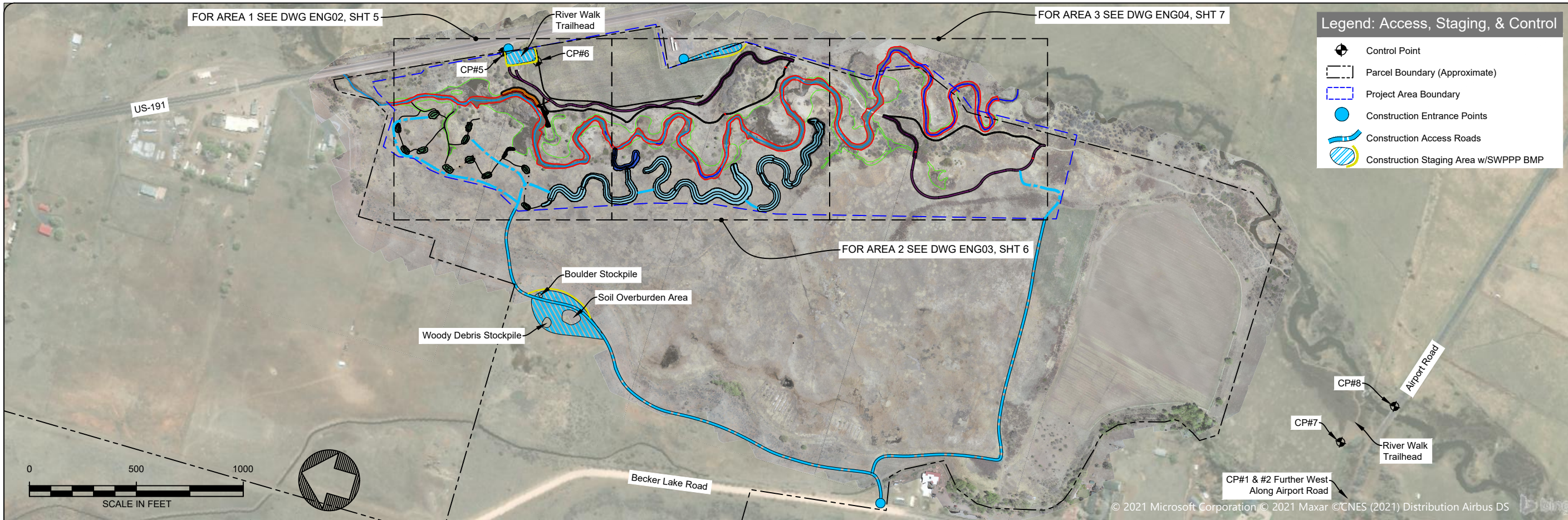
| Task 4: Develop & Implement Monitoring Plan | | | | | | | |
|---|-----------------------------------|---------------|-------------|-----------------------|---|--------------------|--------------------|
| Item Number | Item Description | Amount | Unit | Unit Cost | Total Cost | | |
| 4.1 | (AGFD) Colorado Basin Coordinator | 300 | HOUR | \$46.02 | \$13,806.00 | | |
| 4.2 | (OEE) Travel: Mileage | 2,900 | MILES | \$0.445 | \$1,290.50 | | |
| 4.3 | (OEE) Travel: Lodging & Per Diem | 20 | DAYS | \$85.00 | \$1,700.00 | | |
| | | | | TASK 4 TOTAL = | | \$16,796.50 | |
| Task 5: Complete Final Report & Presentation | | | | | | | |
| Item Number | Item Description | Amount | Unit | Unit Cost | Total Cost | | |
| 5.1 | (AGFD) Colorado Basin Coordinator | 40 | HOUR | \$46.02 | \$1,840.80 | | |
| 5.2 | (OEE) Travel: Mileage | 290 | MILES | \$0.445 | \$129.05 | | |
| 5.3 | (OEE) Travel: Lodging & Per Diem | 1 | DAYS | \$85.00 | \$85.00 | | |
| | | | | TASK 5 TOTAL = | | \$2,054.85 | |
| | | | | | Arizona Water Protection Fund Grant Application: Matching Funds / Cost Share Total = | | \$30,099.55 |

Arizona Watershed Map FY 2023



Title of Project: Becker Lake Wildlife Area: Little Colorado River Habitat Improvement Project

Location: UTM 12N / Township 9N, Range 29E, Section 29 & 32, Apache County, Arizona



Legend: Access, Staging, & Control

- Control Point
- Parcel Boundary (Approximate)
- Project Area Boundary
- Construction Entrance Points
- Construction Access Roads
- Construction Staging Area w/SWPPP BMP

oxbow
ecological engineering, llc
river + riparian + wetland + wildland
3491 S Gillenwater Dr • Flagstaff, AZ 86005
(928) 266-6192 • www.oxbow-eco-eng.com

PROJECT NAME:
Becker Lake Wildlife Area
Little Colorado River
Habitat Improvement
Project

LOCATION:
Becker Lake Wildlife Area
Apache County, AZ

PROJECT NUMBER:
AGFD17-182274-OXBOW
Order No. PO0000284960

PROJECT PHASE:
100% Submittal
Construction Set

CLIENT/PROJECT MANAGER:
Arizona Game & Fish Department
5000 West Carefree Highway
Phoenix, AZ 85086
(602) 942-3000

RESTORATION TECHNICAL ADVISOR:
Fred Phillips Consulting, LLC
17285 Highway 550
Ridgway, CO 81432
(928) 380-5058

RESTORATION TECHNICAL ADVISOR:
Watershed Artisans, Inc.
1000 Cordova Place #832
Santa Fe, NM, 87505
(505) 577-9625

DRAWN BY: G. Cathey
DESIGNED BY: G. Cathey

ENGINEER OF RECORD:

UNAUTHORIZED CHANGES & USES:
The engineer preparing these plans will not be responsible for, or liable for, unauthorized changes to or uses of these plans. All changes must be in writing and must be approved by the engineer of record.

PLAN REPRODUCTION:
The plans have been created on ANSI B (11 IN. x 17 IN.) sheets. For reductions, refer to graphic scale. The plans have been created for full color plotting. Any set of the plans that is not plotted in full color shall not be considered adequate. Warning: Information may be lost in copying and/or gray scale plotting.

811 Know what's below. Call before you dig.

DATE: 8.25.22 **OEE PROJECT #:** AZ-009-6

DRAWING:
Project Overview: Access & Staging, Construction Summary, Data, & Control

DRAWING #: ENG01 **SHEET #:** 4 OF 9 **REVISION #:** 2

Abbreviations

- @ AT
- AC ACRE
- APPROX APPROXIMATELY
- CC CENTER TO CENTER
- CL CENTER LINE
- CLF CHIRICAHUA LEOPARD FROG
- CP CONTROL POINT
- CY CUBIC YARD
- Ø DIAMETER
- DTL DETAIL
- DWG DRAWING
- EA EACH
- ELEV ELEVATION
- EX EXISTING
- FG FINISHED GRADE ELEVATION
- FL FLOWLINE ELEVATION
- FT FEET
- GB GRADE BREAK
- IN. INCH
- L LENGTH
- LCRSD LITTLE COLORADO RIVER SPINEDACE
- LF LINEAR FEET
- LS LUMP SUM
- MAX MAXIMUM
- M.E. MATCH EXISTING
- MIN MINIMUM
- MISC MISCELLANEOUS
- NMMJM NEW MEXICO MEADOW JUMPING MOUSE
- NO. NUMBER
- NTS NOT TO SCALE
- OC ON CENTER
- PROP. PROPOSED
- REQD. REQUIRED
- SF SQUARE FEET
- SHT SHEET
- STA STATION
- W/ WITH

Legend

- EXISTING FEATURES**
- Fenceline (Approximate)
 - Little Colorado River Thalweg
 - Major Contour @ 5 Foot Interval
 - Minor Contour @ 1 Foot Interval
 - Ordinary High Water Mark
 - Jurisdictional Wetlands
- PROPOSED FEATURES**
- View, Section, or Detail Indicator
 - Construction Note (See Below)
 - Major Contour @ 5 Foot Interval
 - Minor Contour @ 1 Foot Interval
 - Streambank Soil Bioengineering
 - Boulders
 - River Trail
 - River Trail Decommissioning
 - Culvert
 - Irrigation Ditch
 - Woody Debris
 - Floodplain Swale
 - Floodplain Depression
 - Backwater Channel
 - Brush Trimming Zone
 - Willow Clump Planting Zone

Construction Notes & Estimated Quantities

- DIVISION 100: GENERAL SPECIFICATIONS**
- 103.1 (1 LS) Fulfill General Requirements
 - 104.1 (1 LS) Mobilize & Demobilize Equipment
- DIVISION 200: EARTHWORK**
- 201.1 (4,620 CY) Floodplain Swales: Excavate, Shape, Haul, & Place
 - 201.2 (400 CY) Floodplain Depressions: Excavate, Shape, Haul, & Place
 - 201.3 (380 CY) Backwater Channels: Excavate, Shape, Haul, & Place
 - 201.4 (350 CY) Streambank Soil Bioengineering: Excavate, Shape, Haul, & Place
 - 201.5 (1,010 LF) Irrigation Ditch: Excavate, Shape, Haul, & Place
- DIVISION 300: RIVERSCAPE STRUCTURES**
- 301.1 (180 LF) Streambank Soil Bioengineering: Supply & Construct Toe Protection
 - 302.1 (1 LS) Boulders: Transport & Install
 - 303.1 (2,760 LF) River Trail: Supply & Construct
 - 303.2 (2,220 LF) River Trail: Decommission
 - 304.1 (5 EA) Culvert: Salvage, Transport, & Place
 - 305.1 (1 LS) Woody Debris: Sort, Transport, & Place
- DIVISION 400: NATIVE PLANTINGS**
- 401.1 (2.45 AC) Riparian Sodmat: Salvage/Harvest & Transplant
 - 402.1 (290 CLUMPS) Willow Clump: Salvage/Harvest & Transplant
 - 403.1 (0.50 AC) Native Seed: Supply, Broadcast, & Mulch

TABLE 1: Data Sources

| NUMBER | TYPE | DATE | SOURCE | DESCRIPTION |
|--------|--|-----------|------------------------------|---|
| 1 | Aerial Imagery | 4/2020 | Oxbow Ecological Engineering | UAS derived digital orthoimagery |
| 2 | Topography | 4/2020 | Oxbow Ecological Engineering | Surface derived from UAS photogrammetric point cloud data |
| 3 | Topography | 6/2020 | Oxbow Ecological Engineering | Surface derived from supplemental RTK GPS survey |
| 4 | Parcel Boundary | NA | AGFD | SHP file, approximate, not the result of a boundary survey |
| 5 | Preliminary Jurisdictional Determination | 5/27/2020 | Fred Phillips Consulting | Jurisdictional Wetlands and Ordinary High Water Mark from File No. SPL-2020-00300 |

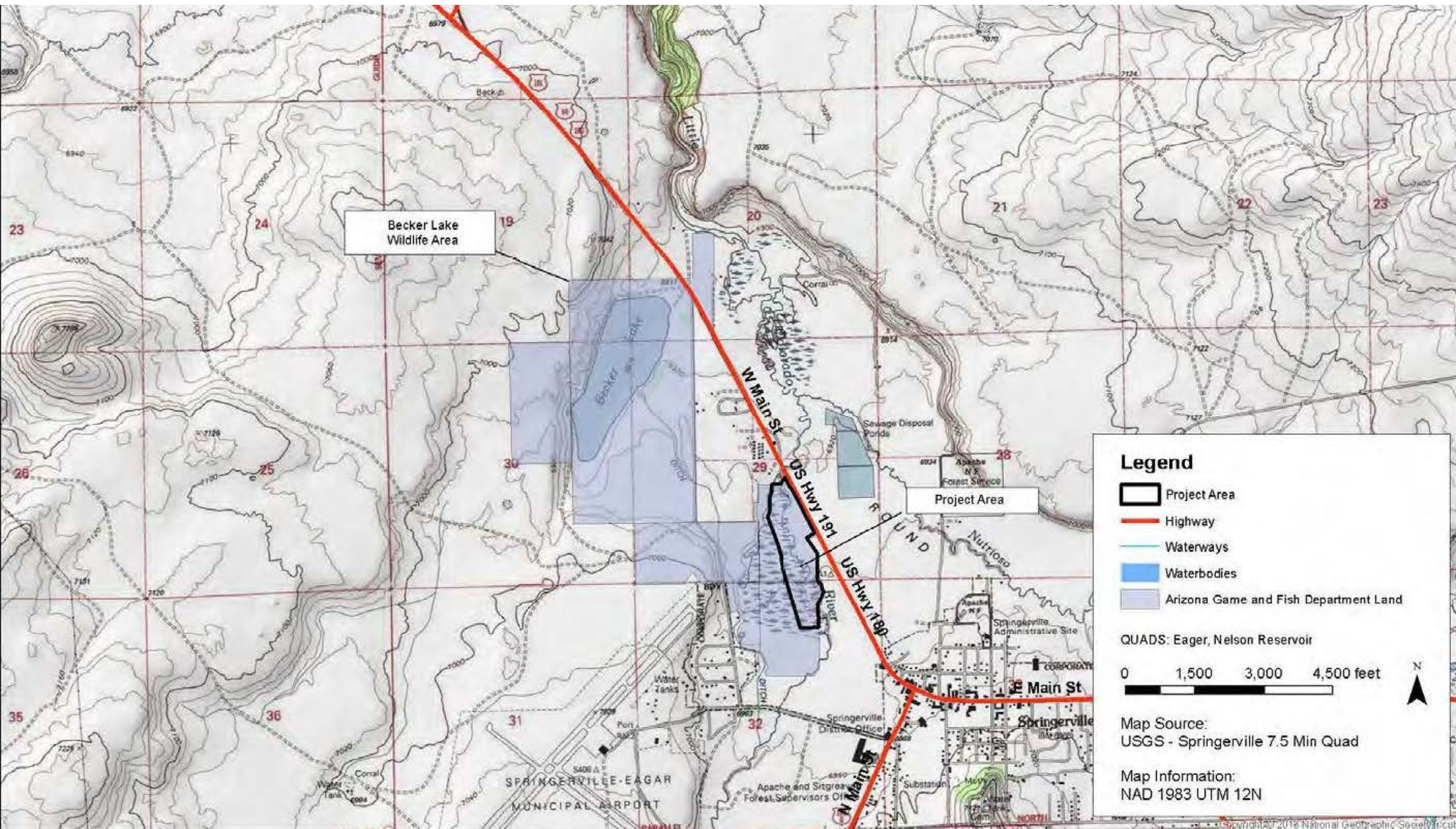
TABLE 2: Datum & Coordinate Projection Information

| | |
|-----------------------------|--------------------------------------|
| HORIZONTAL DATUM | NAD83(2011) |
| PROJECTED COORDINATE SYSTEM | ARIZONA STATE PLANE EAST ZONE (0201) |
| VERTICAL DATUM | NAVD88 |
| GEOID MODEL | GEOID18 (CONUS) |
| UNITS | INTERNATIONAL FEET |

TABLE 3: Control Points

| NUMBER | NORTHING | EASTING | ELEVATION | DESIGNATION | DESCRIPTION |
|--------|--------------|------------|-----------|-----------------------|---|
| 1 | 1,140,343.29 | 960,569.61 | 7,029.45 | PORT (PID ER0378) | AZ DOT BRASS MONUMENT |
| 2 | 1,140,338.06 | 960,534.40 | 7,029.28 | PORT RM2 (PID ER0379) | AZ DOT BRASS MONUMENT |
| 5 | 1,145,181.11 | 964,109.03 | 6,928.01 | CTCP OEE CAP | ORANGE PLASTIC CAP STAMPED WITH "OXBOW ECO ENG" |
| 6 | 1,145,016.16 | 964,111.61 | 6,928.80 | CTCP OEE CAP | ORANGE PLASTIC CAP STAMPED WITH "OXBOW ECO ENG" |
| 7 | 1,140,906.23 | 963,480.84 | 6,955.95 | CTCP OEE CAP | ORANGE PLASTIC CAP STAMPED WITH "OXBOW ECO ENG" |
| 8 | 1,140,712.19 | 963,713.70 | 6,963.46 | 121 (PID ER0377) | AZ HIGHWAY DEPT. BRASS MONUMENT |

Project Location: Ownership Map



STATE HISTORIC PRESERVATION OFFICE

Review Form

In accordance with the State Historic Preservation Act (SHPO), A.R.S. 41-861 *et seq.*, effective July 24, 1982, each State agency must consider the potential of activities or projects to impact significant cultural resources. Also, each State agency is required to consult with the State Historic Preservation Officer with regard to those activities or projects that may impact cultural resources. Therefore, it is understood that **recipients of state funds are required to comply with this law** throughout the project period. All projects that affect the ground-surface that are funded by AWPf require SHPO clearance, **including those on private and federal lands.**

The State Historic Preservation Office (SHPO) must review each grant application recommended for funding in order to determine the effect, if any, a proposed project may have on archaeological or cultural resources. To assist the SHPO in this review, the following information **MUST** be submitted with each application for funding assistance:

- A completed copy of this form, and
 - A United States Geological Survey (USGS) 7.5-minute map
 - A copy of the cultural resources survey report if a survey of the property has been conducted, and
 - A copy of any comments of the land managing agency/landowner (i.e., state, federal, county, municipal) on potential impacts of the project on historic properties.
- NOTE: If a federal agency is involved, the agency must consult with SHPO pursuant to the National Historic Preservation Act (NHPA); a state agency must consult with SHPO pursuant to the State Historic Preservation Act (SHPA),
- OR**
- A copy of SHPO comments if the survey report has already been reviewed by SHPO.

Please answer the following questions:

1. Grant Program: Arizona Water Protection Fund
2. Project Title: Becker Lake Wildlife Area: Little Colorado River Habitat Improvement Project
3. Applicant Name and Address:
Skyler Hedden, Arizona Game and Fish Department
5000 W. Carefree Highway
Phoenix, AZ 85086
4. Current Land Owner/Manager(s): Arizona Game and Fish Commission/Arizona Game and Fish Department
5. Project Location, including Township, Range, Section: Township 9N, Range 29E, Section 29 & 32
6. Total Project Area in Acres (or total miles if trail, fence line, etc.): 47.5
7. Does the proposed project have the potential to disturb the surface and/or subsurface of the ground?
 YES NO
8. Please provide a brief description of the proposed project and specifically identify any surface or subsurface impacts that are expected: The proposed undertaking consists of a 47.5-acre habitat improvement project within the Little Colorado River (LCR) riparian corridor in BLWA. The total length of the project runs approximately 6,400 linear feet along the LCR. Project activities will fall into the following sub-phases: Site preparation, Earthworks, Stream and Floodplain Structures, and Trail Realignment. All phases of work will involve heavy equipment and will cause surface impacts. Earthwork excavation activities will cause subsurface impacts.

9. Describe the condition of the current ground surface within the entire project boundary area (for example, is the ground in a natural undisturbed condition, or has it been bladed, paved, graded, etc.). Estimate horizontal and vertical extent of existing disturbance. Also, attach photographs of project area to document condition: Project site is 75-100% open, with obscuration in some areas due to vegetation. Immediately along the Little Colorado River visibility is low due to riparian vegetation. A well-maintained recreational trail runs along the Little Colorado River, with associated parking lot and picnic area, interpretive signage, and other infrastructure. See attached "Becker Lake Wildlife Area Archaeological Survey" report for representative pictures.

10. Are there any known prehistoric and/or historic archaeological sites in or near the project area? YES NO

11. Has the project area been previously surveyed for cultural resources by a qualified archaeologist? YES NO UNKOWN

If YES, submit a copy of the survey report. Please attach any comments on the survey report made by the managing agency and/or SHPO

Project location has been reviewed for cultural, archaeological, and historical resources. The AGFD Cultural Resource Compliance Manager consulted with the State Historic Preservation Office (SHPO). SHPO concurred with a finding of *No Historic or Cultural Properties Affected.*


12. Are there any buildings or structures (including mines, bridges, dams, canals, etc.), which are 50-years or older in or adjacent to the project area? YES NO

If YES, complete an Arizona Historic Property Inventory Form for each building or structure, attach it to this form and submit it with your application.

13. Is your project area within or near a historic district? YES NO

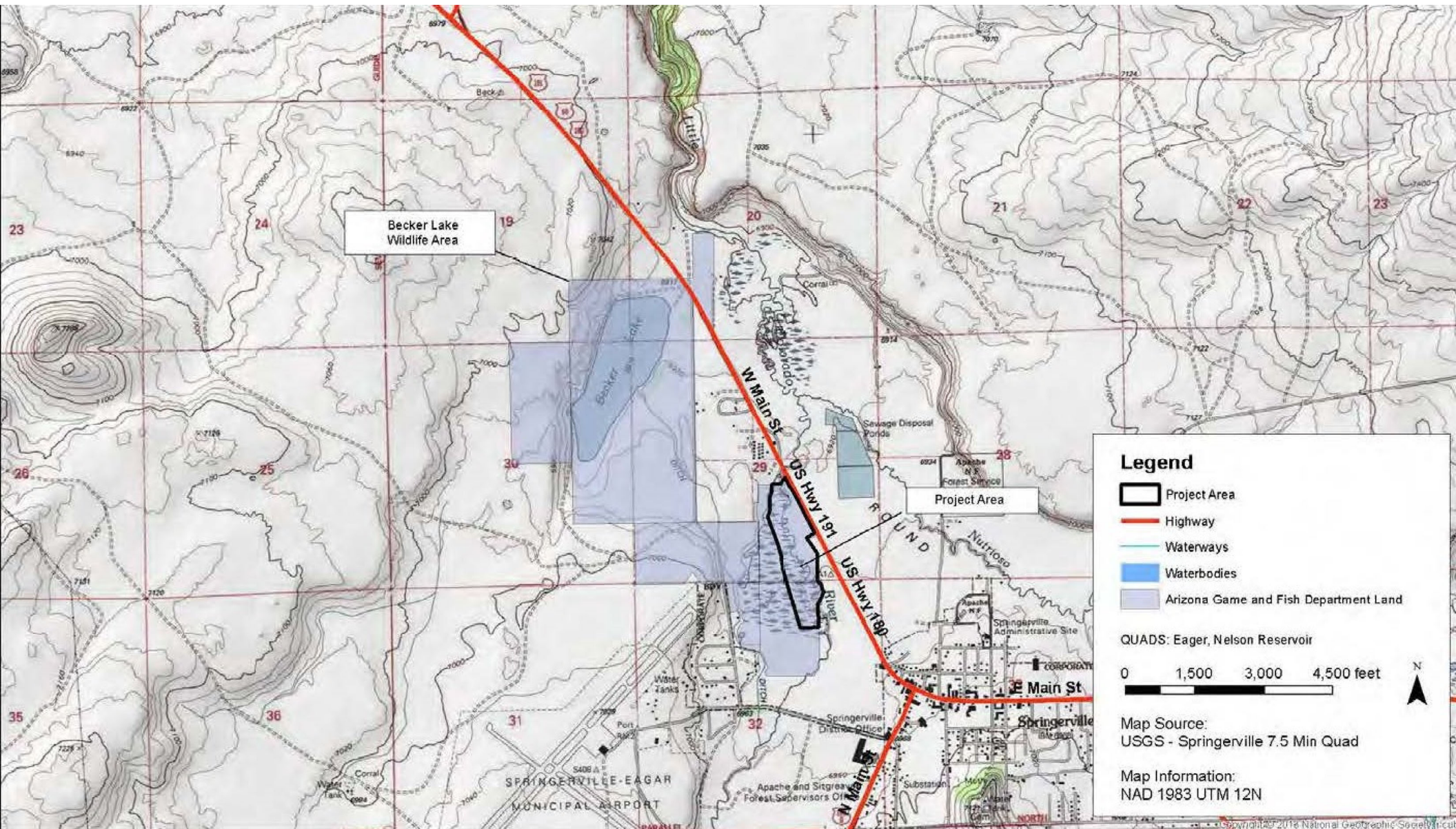
If YES, name of the district:

Please sign on the line below certifying all information provided for this application is accurate to the best of your knowledge.

 / 8/21/2022 Skyler Hedden
 Applicant Signature /Date Applicant Printed Name

| FOR SHPO USE ONLY | |
|---|-------|
| SHPO Finding: <input type="checkbox"/> Funding this project will not affect historic properties. <input type="checkbox"/> Survey necessary – further GRANTS/SHPO consultation required (<i>grant funds will not be released until consultation has been completed</i>) <input type="checkbox"/> Cultural resources present – further GRANTS/SHPO consultation required (<i>grant funds will not be released until consultation has been completed</i>) | |
| SHPO Comments: | |
| For State Historic Preservation Office: | Date: |

SHPO: United States Geological Survey (USGS) 7.5-minute map



Becker Lake Wildlife Area Archaeological Survey, Apache County, Arizona

Prepared for

Oxbow Ecological Engineering, LLC

Prepared by



NOT FOR DISTRIBUTION OR REPRODUCTION

Federal and state agencies have legal responsibilities to safeguard locational information about cultural resources and must restrict access to cultural site locations depicted in this report and other information about cultural resources per Arizona Revised Statute §39-125, the National Historic Preservation Act, Title III, §304, and the Archaeological Resource Protection Act (16USC470aa et seq.).

October 2020



RECORDS RESEARCH RESULTS

ASM Job Number: 2749

Date Completed: 10/19/2020

Client: Cornerstone Environmental Consulting

Project Number: 20-123

ASM staff in the Archaeological Records Office (ARO) have completed the requested records research. Please review the information provided in the following sections.

Section 1. ASM Sites

ASM sites submitted to the ARO that intersect the requested records research area are identified in the following table.

None

Available information regarding the recording(s) of each ASM site is included in an attached Excel spreadsheet (see Section 3).

Section 2. AAA Permitted Projects

AAA permitted projects submitted to the ARO that intersect the requested research area are identified in the following table.

| | | | |
|-------------------|--------------|--------------|--------------|
| 1948-0001/AT-2440 | 1999-0387 | AP-2008-0277 | AP-2018-0019 |
| 1998-0013 | AP-2005-1111 | | |

Available information regarding each AAA permitted project is included in an attached Excel spreadsheet (see Section 3). This spreadsheet includes projects that recorded ASM sites and negative surveys.

Projects are listed by ASM Accession and/or AZProj number. The prefix "AP-" indicates an ASM Accession number. An AZProj number will not have the "AP-" prefix. A project with "ASIF" in its AZProj number is located in the ARO's Additional Site Information Files.

Section 3. Attached Deliverables

- Spreadsheet listing AAA permitted projects and ASM sites that intersect the research area

File name of attached Excel spreadsheet:

records_research_spreadsheet_Cornerstone_20-123.xlsx

PDF Maps

- Maps not requested
- Maps of ASM sites that intersect the research area

File names of each map:

- Maps of AAA permitted projects that intersect the research area

File names of each map:

Section 4. Notes

1. In Section 1, no ASM sites intersect the research area. No outstanding ASM sites (i.e., sites that have not yet been submitted to the ASM) intersect the research area.



THE UNIVERSITY OF ARIZONA

**ARIZONA
STATE MUSEUM**

RECORDS RESEARCH RESULTS

Section 5. Data Restriction and Disclaimer

All recipients of the delivered data are advised that further dissemination of the data could be restricted pursuant to 5 U.S.C. §552 (Freedom of Information Act) or Arizona Revised Statutes §39-125, or both.

Electronic distribution of data from within Tribal boundaries is prohibited; therefore, if such data are within the requested records research area, then the data will be delivered as hard copy.

Data are only as accurate and complete as what was submitted to the ARO.

Please direct questions to Emily Fiocoprile by email at efiocop@email.arizona.edu or by telephone at 520-621-4011.

| azproj_number | asm_accession_number | negative_survey | client | project_number | project_name | site_number | site_consolidated_into | NRHP_recommendation_section | type | Comments | non-collection_survey | collection_survey | non-site_monitoring | site_monitoring | testing | excavation | site_located |
|---------------|----------------------|-----------------|---|----------------|--|-------------|------------------------|-----------------------------|------|---|-----------------------|-------------------|---------------------|-----------------|---------|------------|--------------|
| 1948-0001 | AT-2440 | No | Peabody Museum of Archaeology & Ethnology | Unknown | An Archaeological Survey of West Central New Mexico and East Central Arizona | | | | | The ASM sites recorded by this project do not intersect the research area. | No | Yes | No | No | No | No | |
| 1998-0013 | | Yes | Kinlani Archaeology, Ltd. | 98-1 | Citizen's Buried Cable ROW, Springerville | | | | | | Yes | No | No | No | No | No | |
| 1999-0387 | | No | Archaeological Consulting Services, Ltd. | 99-16 | Springerville/US 60 | | | | | The ASM site recorded by this project does not intersect the research area. | Yes | No | No | No | No | No | |
| 2005-1111 | 2005-1111 | No | Four Corners Research | 05-212 | Little Colorado River Riparian Surveys | | | | | The ASM sites recorded by this project do not intersect the research area. | Yes | No | No | No | No | No | |
| 2008-0277 | 2008-0277 | Yes | Stantec Consulting, Inc. | 182000541A | Springerville Becker Lake Bridge Survey | | | | | | Yes | No | No | No | No | No | |
| 2018-0019 | 2018-0019 | No | Archaeological Consulting Services, Ltd. | 17-246:CSUR | Becker Ditch, Becker Lake Wildlife Area Survey | | | | | The ASM sites recorded by this project do not intersect the research area. | Yes | No | No | No | No | No | |

COMPLIANCE DOCUMENTATION FORM

Funding

& Index #(s): Heritage – Index #13072

Project Title: *Becker Lake Wildlife Area - Little Colorado River Habitat Improvement Project*

Start Date: 3/23/2021

End Date: 3/23/2026

Endangered Species Act (ESA)

✓ Section 7 Biological Evaluation form is attached for review and determination.

National Environmental Policy Act (NEPA)

✓ Based on Commission Policy I2.2, Department actions have been examined per the Environmental Assessment Checklist process.

National Historic Preservation Act (NHPA) and/or State Historic Preservation Act (SHPA)

✓ Project location has been reviewed for cultural, archaeological, and historical resources. The AGFD Cultural Resource Compliance Manager consulted with the State Historic Preservation Office (SHPO). SHPO concurred with a finding of **No Historic or Cultural Properties Affected.**

| | | |
|----------------------|---------------|---------------|
| Habitat Branch Chief | Luke Thompson | 3/23/21 |
| | _____ Name | _____ Date |



January 27, 2021

Ms. Kathryn Leonard
State Historic Preservation Officer
State Historic Preservation Office
1100 W Washington
Phoenix, AZ 85007

Re: **AZGFD-SHPO Consultation - Becker Lake Wildlife Area LCR Habitat Improvement Project / AGFD EAC #M21-0108105404**

Dear Ms. Leonard:

The Arizona Game and Fish Department (AZGFD) is consulting with your office regarding the above mentioned project located in Apache County, Arizona.

The proposed project is located in T9N, R29E, Sections 29 and 32, Gila and Salt River Meridian. The Area of Potential Effects (APE) consists of approximately 47.5 acres located on the Becker Lake Wildlife Area (BLWA) on land administered by the Department. Funding will be provided by the State of Arizona. Because proposed undertakings will utilize state funding on AZGFD land, the project is subject to compliance under the guidelines of the State of Arizona per the Arizona State Historic Preservation Act (SHPA), A.R.S. §41-861 et seq., and the Arizona Antiquities Act (AAA).

Proposed Project

The proposed undertaking consists of a 47.5-acre habitat improvement project within the Little Colorado River (LCR) riparian corridor in BLWA. The total length of the project runs approximately 6,400 linear feet along the LCR. Phase 1 activities described below are those that can occur outside of jurisdictional waters, thus not requiring an Army Corps of Engineers 404 permit. The AZGFD acknowledges that additional consultation may be required for Phase 2.

Habitat Improvement Demonstration Project - Phase 1

Project activities will fall into the following sub-phases: Site preparation, Earthworks, Stream and Floodplain Structures, and Trail Realignment. Construction activities are anticipated to take no longer than 10-16 weeks, and will be conducted by a combination of contractors and Department personnel. Large equipment will be mobilized and stationed at the current River Walk parking lot onsite. All heavy equipment would be cleaned prior to construction to avoid introducing non-native invasive plants. All construction activities will be completed outside of the active breeding season for the Western yellow-billed cuckoo, unless a monitor is present.

Site Preparation

The footprint of earthwork cut/fill and to-be-installed structures, as designated on the plan, will be cleared mechanically (by excavators or backhoes) and by hand-held power tools such as chainsaws, weed whackers, and power brush cutters. Any undesirable, invasive plants found in the footprint of earthwork cut/fill and to-be-installed structures will be pulled, dug out, or mulched over to prevent regrowth and reduce competition with native plants to be planted. Cleared plant material shall be left on site and placed outside the river corridor in designated areas. Currently, AZGFD routinely controls for invasive plants such as Siberian elm, Russian olive, exotic common reed grass, and Musk thistle within the BLWA, but if any additional species are detected, they will be treated appropriately, and will be disposed of offsite if resprout from mulching could occur. Any cottonwood, willow, or other native trees and shrubs on site will be preserved, with the critical root zone delineated so that heavy machinery won't damage the specimens.

Earthworks

Earthworks will involve the recontouring for future reconnection of relic floodplain channels to the river, as well as the excavation of backwater wetlands to ease hydraulic pressure during flood events; all of these activities will occur outside of the Ordinary High Water Mark (OHWM) shown in red on Figures 6a and 6b. A low ground pressure excavator, or similar, will likely be used for these activities. The OHWM will be staked or marked then allowing all work to be conducted outside of the OHWM, see Figure 6c. The excavated soil from on site will be used for construction of floodplain benches/bars as shown in the preliminary drawings. The excavator will be used to create topographic/soil saturation variation and gradual sloping in the currently, relatively flat, featureless floodplain. Existing headcuts will also be reshaped, such that the steep vertical drops and resulting erosion and channel incision are reduced. Meanders will be carved along the riparian corridor in the project area; these forms will help dissipate the energy of the running water and allow gentle overflow onto the surrounding floodplains, further reducing future erosion. Pools and basins will also be excavated.

5,500 cubic yards of earth will be excavated into the existing floodplains to create connector swales. Another 500 cubic yards will be excavated to create floodplain channels. 1,200 cubic yards will be excavated for backwater channels. 1,800 cubic yards of earth will be excavated and shaped for banklines and pools. Finally, an irrigation ditch 790 ft long will be excavated on site (context). A Stormwater Pollution Prevention Plan (SWPPP) will be prepared by either Oxbow or the construction contractor; this plan will detail measures and Best Management Practices (BMP) to be implemented to prevent sedimentation into the existing channel, such as the installation of silt fence and other erosion control materials. Excavated material (i.e. spoils) will be stored onsite for use during the future Phase 2 to plug the existing channel.

Stream & Floodplain Structures

After earthwork is complete, floodplain structures will be constructed using a combination of rocks, logs, and other natural debris found on site. Floodplain structures to be built on site will include 3 riffles, 600 linear feet of bioengineered streambank benches, and 9 juniper log jams.

Reshaped headcuts, the inlets and outlets of new meander pools, and newly excavated basins and channels will be lined with rocks embedded into the soil to bolster erosion resistance while creating aquatic habitat. The log jams, constructed from woody debris, will be placed across the floodplain at the top of constructed bars and benches. These woody structures will provide habitat coverage, egg mass attachment points, and potential points for future beaver dam activity while also introducing hydraulic variation and flow convergence for scour pool creation.

Trail Realignment

To address the degradation of the existing river trail, a new river trail running approximately 2,500 feet will be constructed within the planned cottonwood gallery planting. A force plate compactor/mechanized tamper or similar will be used to flatten the graded trail. Weed fabric and the ¾ Minus gravel will be added and compacted to stabilize the dirt trail. Interpretive and other signage, benches, and safety fencing/railing associated with the trail will be placed along the new river trail as appropriate.

All native plantings will occur under Phase 2, once the current channel can be connected to the new alignment created during Phase 1.

Cultural Resource Considerations and Tribal Consultations

The entire APE has been surveyed for cultural resources/historic properties and the negative findings are reported in the Survey Report Summary Form (SRSF):

Jack W. Treichler, and Kevin Dickinson

*2020 Becker Lake Wildlife Area Archaeological Survey, Apache County, Arizona. ASM
Accession No. 2020-0350, Cornerstone Environmental Report No. CEC 20-123.*

According to the report no known archaeological sites or other historic properties are located within the APE. The SRSF will no doubt seem familiar, since your office recently reviewed the report and provided the AZGFD with concurrence on its adequacy (SHPO-2020-1663 [157068]). Several of the project specifications were still under review by AZGFD project proponents and the survey report was submitted to your office for concurrence on a recommendation of report adequacy in advance of the completed project proposal.

Based upon the above information, the AZGFD requests that SHPO concur with a recommendation of "No Historic Properties Affected" for this project. Like all Department activities, all aspects of the proposed project are subject to the standard discovery clause:

If any previously unidentified cultural resources (including human remains or cremations) are encountered during any aspect of this project, the crew should immediately stop work at that specific location, take steps to protect the discovery, and immediately call the Cultural Resource Compliance Manager at the Arizona Game and Fish Department at 623-236-7620 who will immediately contact the AZ SHPO in order to determine the appropriate treatment of the Discovery.

January 27, 2021

Page 4

Please review the contents of this letter, the attached maps, photographs, and engineering designs, and let us know if you concur with these findings and recommendations. If you have any questions or concerns, please feel free to contact me by phone at 623-236-7620 or via email at aarnett@azgfd.gov at any time.

Sincerely,



Abraham Arnett
Cultural Resource Compliance Manager, Habitat Branch
Arizona Game and Fish Department

cc: Ginger Ritter, Project Evaluation Program Supervisor

No Historic Properties Affected

Mary-ellen wahl 3/5/21

Arizona State Historic Preservation Office



Figure 1. Location of Becker Lake Wildlife Area within the state.

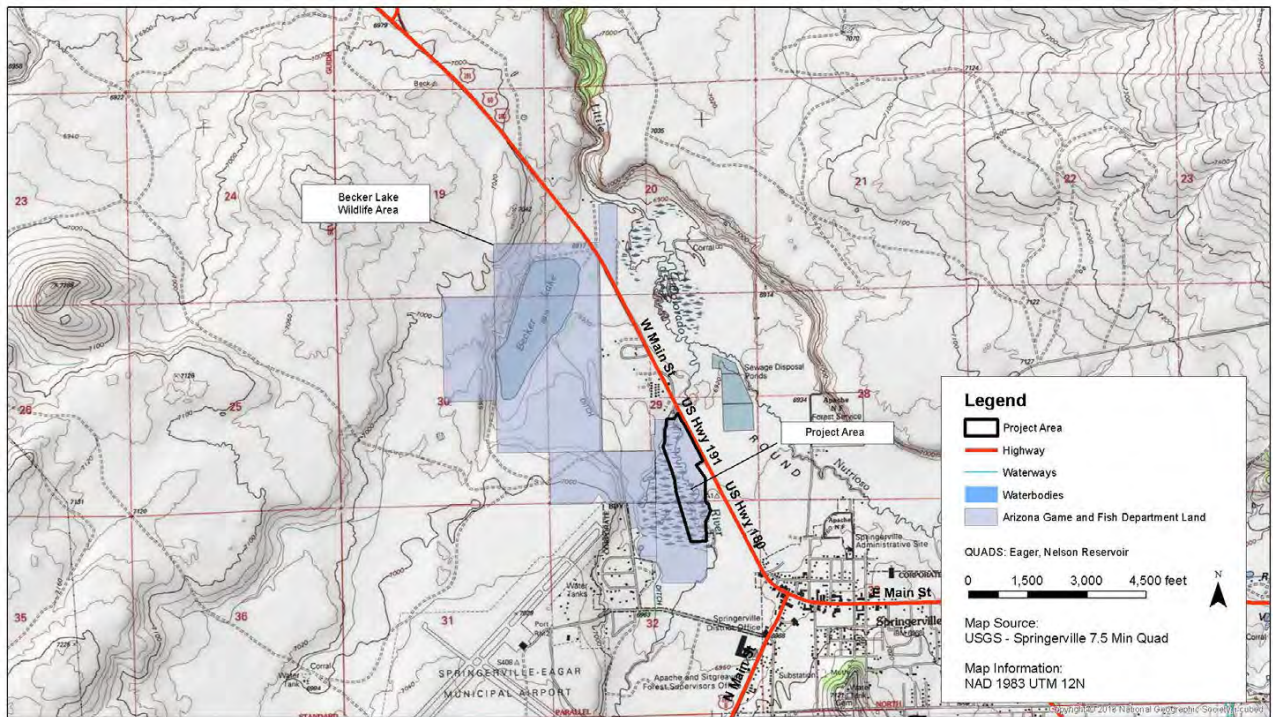
















Figure 2. Regional location of the Becker Lake WA habitat improvement project area.



Figure 3. Photo of project area along the Little Colorado River, facing south.



Figure 4. Relic floodplains channel network within the Little Colorado River floodplain.

| DIVISION 200: EARTHWORK | |
|---|---|
| - | Complete Site Preparation Activities |
|  | Floodplain Connector Swales: Excavate & Shape |
|  | Floodplain Channels: Re-Contour & Shape |
|  | Backwater Channels: Excavate & Shape |
|  | Streambank Soil Bioengineering: Excavate & Shape Bankline & Pools |
|  | Irrigation Ditch: Excavate |
|  | River Trail: Construct & Surface |
| DIVISION 300: STREAM & FLOODPLAIN STRUCTURES | |
|  | Constructed Riffles: Supply & Construct |
|  | Streambank Soil Bioengineering: Supply & Construct Toe Wood Bench |
|  | Beaver Dam Reinforcement & Repair: Supply & Construct |
|  | Log Jam: Supply & Construct |
| DIVISION 400: NATIVE PLANTINGS | |
|  | Supply & Plant Marsh Zone |
|  | Supply & Plant Riparian Sandbar Willow Zone |
|  | Supply & Plant Riparian Cottonwood & Willow Zone |
|  | Supply & Plant Pollinator Habitat Zone |

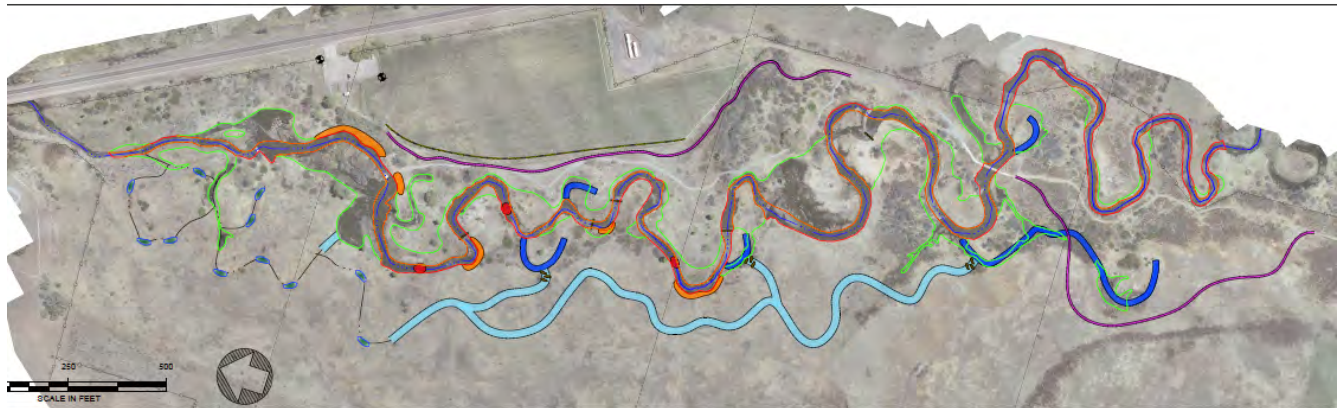


Figure 5. Becker Lake Demonstration Project Phase 1 & 2 (Phase 2 will be included in a separate consultation).

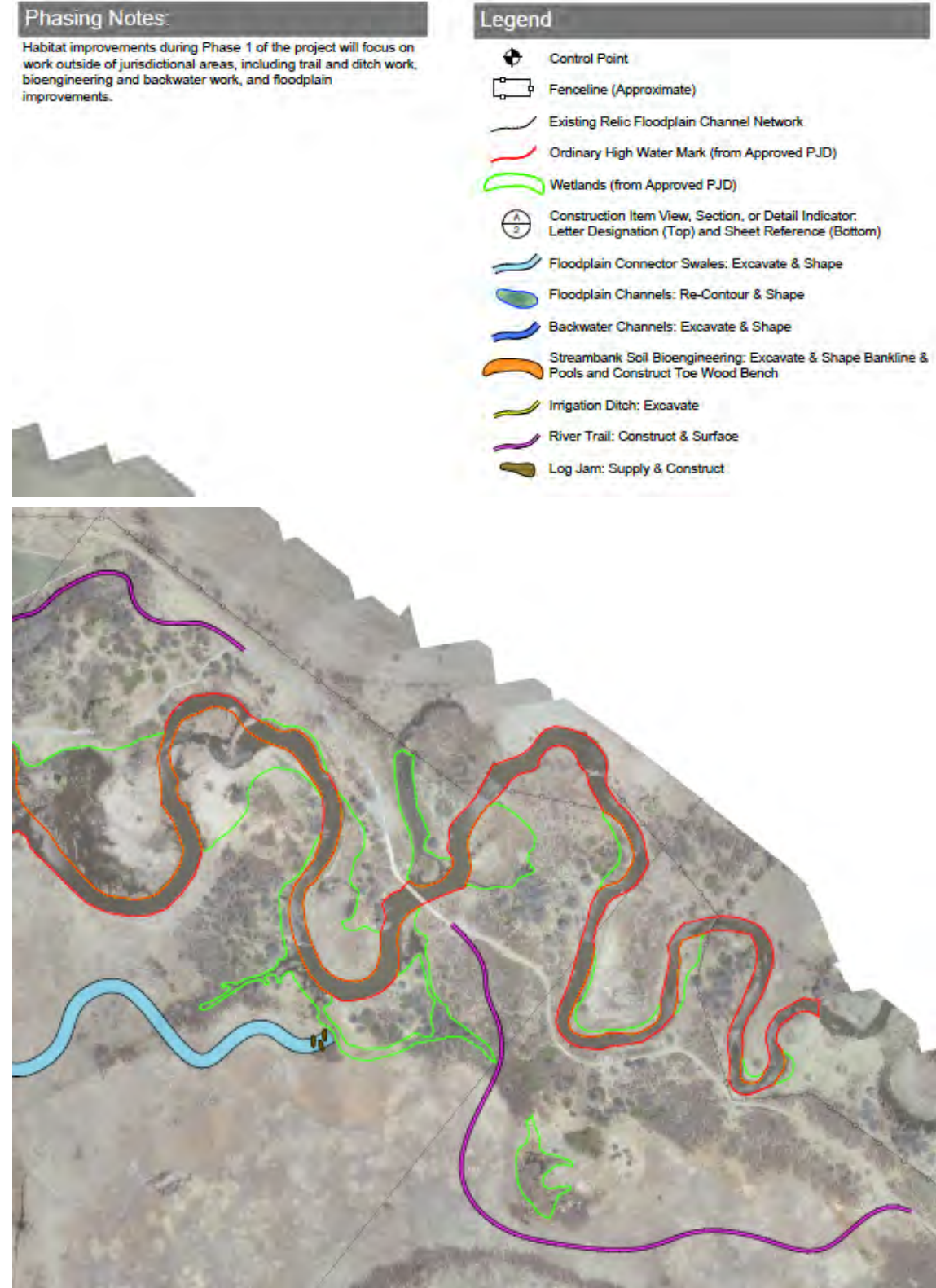


Figure 6a. Northern half of Becker Lake Demonstration Project Phase 1.

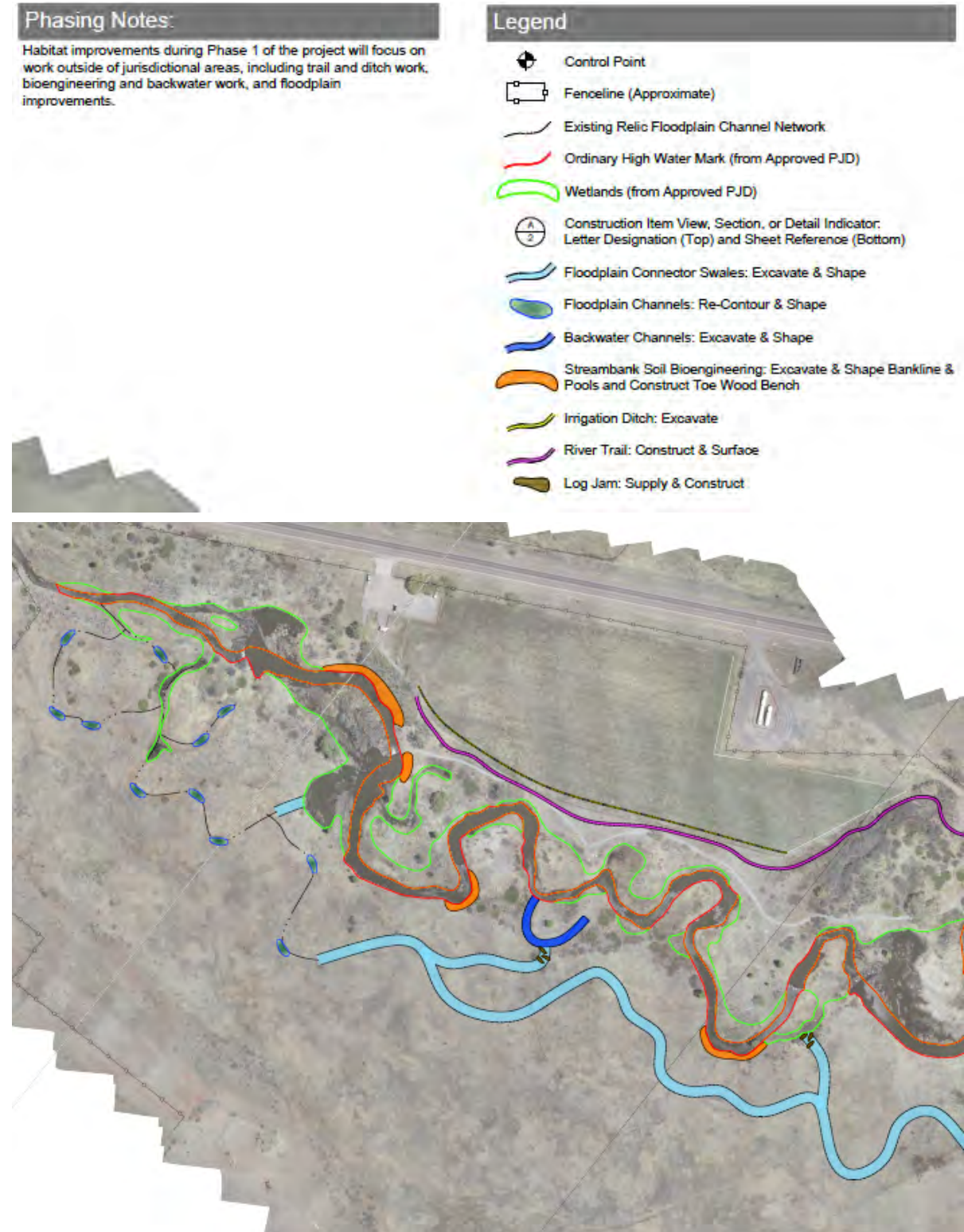
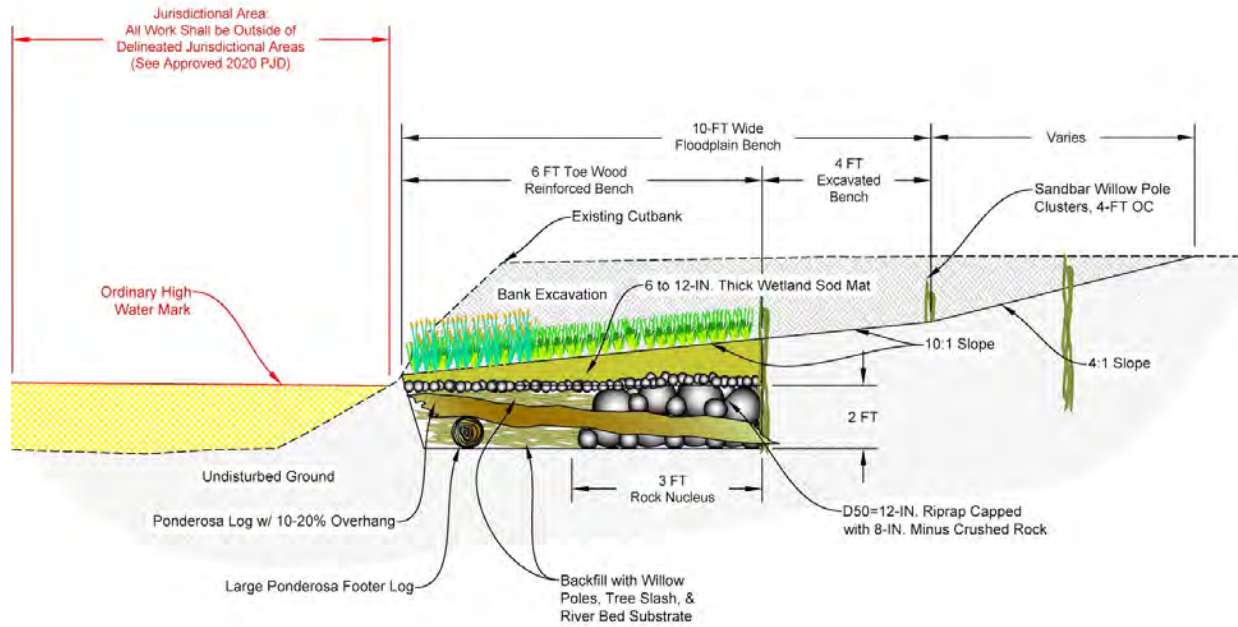


Figure 6b. Southern half of Becker Lake Demonstration Project Phase 1.



A.1 Streambank Soil Bioengineering
- Typical Section NTS

Figure 6c. OHWM avoidance during streambank soil bioengineering.

Skyler C. Hedden

5000 W Carefree Highway, Arizona Game and Fish Department
Phoenix, AZ 85086
Email: shedden@azgfd.gov
Phone: 319-321-0989

Skyler is a fish biologist working for the Arizona Game and Fish Department. Skyler has over 10 years of experience working in aquatic systems, primarily focused on fish, macroinvertebrates, and fluvial stream morphology. Throughout the years he has collaborated with diverse stakeholders including federal, state, tribal, non-profit organizations, and private landowners on multiple grants and projects.

Education

Master of Science, Fisheries Ecology and Conservation, Kansas State University
Bachelor of Science, Fisheries, Wildlife, and Conservation Biology, Kansas State University

Work Experience

Colorado River Basin Native Aquatic Coordinator **Jan 2021 – Current**
Arizona Game and Fish Department

Research Fish Biologist **Jan 2016 – Jan 2021**
Kansas State University

Graduate Teaching Assistant **Jan 2014 – Dec 2015**
Kansas State University

Research Technician **Mar 2013 – Dec 2013**
Kansas State University **May 2012 – Dec 2012**

Research Technician **May 2011 – Sept 2011**
Kansas Department of Wildlife, Parks, and Tourism **May 2010 – Sept 2010**

Projects and Grants

“Rudd Creek Habitat Restoration” Arizona Game & Fish Department – July 2022 (\$243,000)

“Wenima Wildlife Area Habitat Restoration” Arizona Game & Fish Department – December 2021 (\$241,000)

“Aquatic Prioritization Tool Focused on Topeka Shiner and Congeners” U.S. Fish and Wildlife Service - September 2020 (\$40,000)

“Assess Geomorphological Condition of Fox and Palmer Creeks at Tallgrass Prairie National Preserve” National Park Service - April 2019 (\$19,750)

“Range-wide habitat assessment of Loach minnow (*Tiaroga cobitis*) and Spikedace (*Meda fulgida*)” Bureau of Reclamation - April 2019 (\$124,982)

“Facilitated fish passage for enhancing populations of endangered fishes in the San Juan River” Bureau of Reclamation - March 2019 (\$251,704)

“Incidence and consumption of endangered fishes by Channel Catfish (*Ictalurus punctatus*) in the San Juan River” Bureau of Reclamation - March 2017 (\$235,376)

“Population size, mobility, and early life history of Razorback Suckers in the San Juan River – Lake Powell complex” Bureau of Reclamation - March 2016 (\$241,124)

“Determine Implications of Non-native Stock Pond Fish on Native Stream Communities at Tallgrass Prairie National Preserve” National Park Service- August 2015 (\$22,770)

“Management Plan for the Federally Endangered Topeka Shiner (*Notropis topeka*) within Tallgrass Prairie National Preserve” National Park Service - August 2015 (\$24,750)

“Assess Geomorphological Condition of Tallgrass Prairie National Preserve Upland Prairie Stream Reaches” National Park Service - August 2015 (\$23,759)

Publications

19. **Hedden, S.C.**, K.B. Gido, C.K. Hedden, C.A. Pennock, B.R. Duran, B.A. Hines, E.I Gilbert, M.K. McKinstry, S.L. Durst, and N.R. Franssen. In Press. Determining resource intake of a nonnative fish highlights potential predatory and competitive interactions. *Biological Invasions*.
18. Evelyn, I.G., **S.C. Hedden**, N.R. Franssen, and K.B. Gido. In Press. Diet Comparison between juvenile and adult invasive channel catfish in the San Juan River. *The Southwestern Naturalist*.
17. Webster, J.S., K.B. Gido, **S.C Hedden**, D.L. Propst, and J.E. Whitney. In Press. Macroinvertebrates in the Upper Gila River, New Mexico respond to drought, wildfire and monsoonal flooding. *River Research and Applications*.
16. Hedden, C.K., D.L. Propst, K.B. Gido, **S.C. Hedden**, and J.E. Whitney. In Press. Differential responses of native fishes in two headwater tributaries of the Gila River following severe wildfires. *Western North American Naturalist*.
15. **Hedden, S.C.** and K.B. Gido. 2022. Age-specific patterns of occurrence, density, and growth of two cyprinid fishes in headwater prairie streams. *The Southwestern Naturalist* 65:205-215.
14. **Hedden, S.C.**, L.A. Bruckerhoff, K.B. Gido. 2021. Assessing linkages between small impoundments and long-term trajectories in prairie stream fish assemblages. *The American Midland Naturalist* 185:187-200
13. **Hedden, S.C.**, K.B. Gido, C.K. Hedden, C.A. Pennock, B.R. Duran, B.A. Hines, E.I Gilbert, M.K. McKinstry, S.L. Durst, and N.R. Franssen. 2021. Quantifying consumption of native fishes by nonnative channel catfish in a desert river. *North American Journal of Fisheries Management* 41:82-94
12. Pennock, C.A., M. McKinstry, K.B. Gido, C.N. Cathcart, C. Cheek, K. Creighton, D. Elverud, T. Francis, E. Gilbert, **S.C. Hedden**, B. Hines, P. MacKinnon, B. Schleicher. 2020. Movement ecology of imperiled fish in a novel ecosystem: River-reservoir movement by razorback sucker and translocation to aid conservation. *Aquatic Conservation: Marine and Freshwater Ecosystems* 30:1540-1551.
11. Hopper, G.W., K.B. Gido, C.A. Pennock, **S.C. Hedden**, B.D. Frenette, N. Barts, C.K. Hedden, and L.A. Bruckerhoff. 2020. Nowhere to swim: intraspecific responses of prairie stream fishes in isolated pools during severe drought. *Aquatic Sciences* 82:1-15.
10. **Hedden, S.C.** and K.B. Gido. 2020. Dispersal drives temporal changes in fish community abundance in intermittent stream networks. *River Research and Applications* 36:797-806.

9. Hopper, G.W., K.B. Gido, C.A. Pennock, **S.C. Hedden**, C.M. Tobler, C.K. Hedden, and L.A. Bruckerhoff. 2020. Biomass loss and change in species dominance shift stream community excretion stoichiometry during severe drought. *Freshwater Biology* 65:403-416.
8. Perkin, J.S., T.A. Starks, C.A. Pennock, K.B. Gido, G.W. Hopper, and **S.C. Hedden**. 2019. Extreme drought causes fish recruitment failure in a fragmented Great Plains riverscape. *Ecohydrology* 12:e2120.
7. Gido, K.B., D.L. Propst, J.E. Whitney, **S.C. Hedden**, T.F. Turner, and T.J. Pilger. 2019. Pockets of resistance: Response of arid-land fish communities to climate, hydrology, and wildfire. *Freshwater Biology* 64:761-777.
6. **Hedden, S.C.**, E.A. Renner, K.B. Gido, and K.J. Hase. 2018. Impacts of small impoundments on an ephemeral headwater stream community. *The Southwestern Naturalist* 63:34-42.
5. Pennock, C.A., N.C. Cathcart, **S.C. Hedden**, R.E. Weber, and K.B. Gido. 2018. Fine-scale movement and habitat use of a prairie stream fish assemblage. *Oecologia* 186:831-842.
4. Dodds, W.K., S.A. Higgs, M.J. Spangler, J. Guinnip, J.D. Scott, **S.C. Hedden**, B.D. Frenette, R. Taylor, A.E. Schechner, D.J. Hoeinghaus, M.A. Evans-White. 2018. Spatial heterogeneity and controls of ecosystem metabolism in a Great Plains river network. *Hydrobiologia* 797:29-45.
3. Whitney, J.E., K.B. Gido, **S.C. Hedden**, T.J. Pilger, D.L. Propst, and T.F. Turner. 2017. Identifying the source population of fish re-colonizing an arid-land stream following wildfire-induced extirpation using otolith microchemistry. *Hydrobiologia* 797:29-45.
2. **Hedden, S.C.** and K.B. Gido. 2016. Movement distances and activity of introduced flathead catfish (*Pylodictis olivaris*) in the upper Gila River basin, New Mexico, and potential impacts on native fishes. *The Southwestern Naturalist* 61:210-216.
1. **Hedden, S.C.**, K.B. Gido, and J.E. Whitney. 2016. Introduced flathead catfish (*Pylodictis olivaris*) consumptive demand on native fishes of the Upper Gila River, New Mexico. *North American Journal of Fisheries Management* 36:55-61.

Professional Presentations (18)

American Fisheries Society: 2016, 2019
 Desert Fishes Council: 2015, 2018, 2021
 Southwestern Association of Naturalists: 2018
 Society for Freshwater Science: 2015
 North Central Division of the American Fisheries Society: 2015
 Kansas Natural Resource Conference: 2014, 2015, 2017, 2018, 2019, 2020
 Kansas Chapter of the American Fisheries Society: 2016
 International Catfish Symposium: 2020
 Western Division of the American Fisheries Society: 2021
 Arizona-New Mexico Chapter of the American Fisheries Society: 2022

Journal Reviewer

Ecology of Freshwater Fish
 Aquatic Conservation: Marine and Freshwater Ecosystems
 River Research and Applications
 Journal of Animal Ecology
 Journal of Fish Biology

Transactions of the American Fisheries Society
North American Journal of Fisheries Management
Science of the Total Environment
The Southwestern Naturalist
Canadian Journal of Zoology

Professional Memberships

American Fisheries Society
Southwestern Association of Naturalists
Society for Freshwater Science
Desert Fishes Council
The Xerces Society
Kansas subunit of the American Fisheries Society
Kansas Student subunit of the American Fisheries Society member 2010-2015
Executive Committee, Kansas Student subunit of AFS (2011-2012)

George F. Cathey, PE, CERP

3491 South Gillenwater Drive | Flagstaff, Arizona 86005 | (928) 266-6192 | george@oxbow-eco-eng.com

Website: www.oxbow-eco-eng.com | LinkedIn: <https://www.linkedin.com/in/georgecatheyoxbow>

Summary Statement

Passionate and capable ecological restoration practitioner combines 19 years of experience and a specialized skill set to guide river, riparian, wetland, and wildland restoration projects, from concept to completion. Integrates engineering and ecological principles to restore, enhance, and conserve natural systems.

Core Competencies

Project Management

- Project Scoping & Grant/RFP Development
- Scheduling & Budget Development/Tracking
- Manage multiple projects/deadlines simultaneously
- Collaboration with a Diverse Group of Restoration Stakeholders Including Non-Profit Organizations, Volunteers, Landowners, Biologist/Ecologists, A/E Firms, And Construction Contractors as Well as Local, State, Federal, & Tribal Agencies

Ecological Engineering

- Aerial, Topographic, & Bathymetric Engineering Surveys
- 3D Surface Modeling & Design Base Mapping
- Design Plan Drafting Using AutoCAD Civil 3D
- Geomorphic Surveys & Assessments (Rosgen I,II,III)
- Hydrologic & Hydraulic Modeling & Analysis
- River Restoration using a Combination of Analog, Empirical, and Analytical Methodologies
- Streambank Stabilization & Soil Bioengineering
- Culvert & Water Control Structure Design
- Water Delivery & Irrigation System Design
- Wetland/River Grading Design
- Fish Barrier/Passage Assessment & Design
- Erosion Control & Water Harvesting
- Feasibility Studies and Restoration Master Planning
- Reports, Construction Drawings, Technical Specifications, and Engineer's Estimates

Permit Assistance

- Clean Water Act (CWA) National Pollutant Discharge Elimination System (NPDES) Permits and Stormwater Pollution Prevention Plans (SWPPP)
- U.S. Army Corps of Engineers (USACE) 404 Permits
- U.S. EPA Clean Water Act Section 401 Water Quality Certifications
- National Environmental Policy Act (NEPA)

Construction Phase

- Bid Ready Construction Contract Packages
- Pre-bid Meetings & Site Showings
- Pre-Construction Meetings
- Construction Staking and Layout
- Construction Administration (Change Order Negotiation, Contract Dispute Resolution, Scheduling, Observation, Budget Tracking, Material Procurement, & Closeout)
- Record/As-built Surveys and Drawings

Other

- Workshop Development & Teaching
- Monitoring Plans/Implementation (Pre/Post)
- River/Wetland Restoration Workshops
- Revegetation Plans
- Develop & Maintain In-House Quality Standards for Data Management, Surveying, Drafting, Design, Project Documentation, Budgeting, And Billings

Education

M.S. in Civil Engineering | University of New Mexico | Albuquerque, NM | 12/2002

- Environmental Emphasis, thesis defense passed with distinction, Ford Foundation Fellowship Recipient
- Conducted a US Department of Energy funded project to evaluate an innovative in-situ microbial remediation technique to treat uranium contaminated groundwater.

B.S. in Civil Engineering | University of New Mexico | Albuquerque, NM | 5/2000

- Graduated *summa cum laude*, received George E. Breece Award for Highest GPA in the Engineering Class of 2000
- Outstanding Junior Civil Engineering Student Award (1998-1999), Presidential Scholarship Recipient
- Participated in the Waste-Management Education and Research Consortium (WEREC) International Design Contest as part of a multidisciplinary team of engineering students. Designed a full-scale passive chemical/biological system to treat acid mine drainage and built a working bench-scale model that won top honors out of 40 competing universities.

Work History

Principal Engineer/Owner | Oxbow Ecological Engineering, LLC | Flagstaff, AZ | 5/2013 – Present

Founded an awarding winning consulting firm that specializes in restoring, enhancing, and conserving river, riparian, wetland, and wildland ecosystems throughout the southwest. As sole proprietor, responsible for all aspects of the company, including project programming, development, management, design, and implementation.

Civil Engineer/Project Manager | Natural Channel Design, Inc. | Flagstaff, AZ | 5/2009 – 5/2013

Served as project manager for river, riparian, and wetland restoration projects. Worked as part of an interdisciplinary team of ecologists, riparian specialists, geomorphologists, and engineers to guide projects from concept to completion.

Project Engineer | Shephard-Wesnitzer Inc. | Flagstaff, AZ | 11/2007 – 5/2009

Worked as a project engineer for site planning, grading, drainage, habitat restoration, and infrastructure development projects. Delivered design and construction packages, which included drawings, technical specifications, engineer's estimates, design reports, permits, and easements for public and private sector clients.

Project/Regional Engineer | Ducks Unlimited, Inc. | Rancho Cordova, CA | 5/2003 – 6/2007

Planned, surveyed, designed, and constructed civil works associated with wetland and wildland restoration and improvement projects in northern California. Worked as part of a multidisciplinary biologist-engineer team to guide projects from concept to completion. Managed multiple projects with aggregate annual budgets averaging \$2 million.

Awards, Licensure, Training, & Proficiencies

Awards

New Mexico Energy, Minerals, and Natural Resource Department's (EMNRD) 2016 Excellence in Reclamation Award for outstanding work on the Spencer Mine Safeguard and Reclamation Project in McKinley County. This annual award recognizes excellence in coal, hard rock and aggregate mine reclamation and abandoned mine land reclamation projects. Oxbow Ecological Engineering, LLC, was honored for its innovative landforming design to restore a damaged alluvial fan complex (a.k.a. bajada) at the abandoned Spencer Uranium Mine near Grants, New Mexico. OEE developed a regenerative erosion control design to restore natural alluvial fan morphology & function. Design elements included a spoil, infrastructure, and road removal plan, headcut and gully stabilization plan, and re-contouring plan to encourage dispersed flow and stormwater infiltration.

Professional Engineering Licenses

United States Council for International Engineering Practice (USCIEP) International Registry of Professional Engineers (#43594), Arizona (#52164), California (#C69688), New Mexico (#21540), Texas (#109570), Utah (#9130926-2202), Colorado (#49161), Nevada (#22786)

Other Certifications

Society for Ecological Restoration (SER) Certified Ecological Restoration Practitioner (CERP #0152); Federal Aviation Administration (FAA) Remote Pilot (Certificate #4312992)

Professional Organizations

American Ecological Engineering Society (AEES) Member; American Society of Civil Engineers (ASCE) Member; Society for Ecological Restoration (SER) Member

Non-Profit Organizations

2% for Conservation, Trout Unlimited Endorsed Business Member, Quivira Coalition Member, Arizona Riparian Council (ARC) Member, The Nature Conservancy Member, Audubon Society Member, Ducks Unlimited Member

Specialized Training

Low-Tech Process Based Restoration of Riverscapes Courses, Chiricahua Leopard Frog Certification Workshop, FAA Part 107 Test Prep & Training Course for Unmanned Aircraft Systems (UAS); Culvert Design for Fish and Aquatic Organism Passage (ASCE Webinar Series); Wildland Hydrology Short Courses: Applied Fluvial Geomorphology (Level I); River Morphology and Applications (Level II); River Assessment and Monitoring (Level III); and River Restoration and Natural Channel Design (Level IV); Arizona Floodplain Management Association HEC-RAS Short Course; Streambank Soil Bioengineering Workshop (Attended and Taught)

Software/Equipment Proficiencies

AutoCAD Civil 3D (Drafting and Civil Engineering Design), HEC-RAS (Hydraulic Modeling), RIVERMorph (Stream Restoration and Assessment), Global Mapper (GIS), Pix4D (Photogrammetry Software), DJI Phantom 4 Pro V.2 Unmanned Aircraft System (UAS), Trimble Integrated GNSS Surveying Systems (Survey Grade GPS Equipment), Total Station, Laser Level, VisualAnalysis (Concrete, Steel, & Timber Structural FEA Modeling)

Featured Arizona Game & Fish Department Projects

Becker Lake Wildlife Area: Little Colorado River Habitat Improvement Project



| Assessed Habitat | Target Species | Location | Dates |
|--------------------------------------|--|------------------------|--------------|
| River, Riparian, Wetland, Wet Meadow | Little Colorado Spinedace, Little Colorado Sucker, & Other Native Wildlife | Springerville, Arizona | 2019-Ongoing |

References: Julie Carter (623-236-7576), Skyler Hedden (623-236-7509), David Dorum (928-532-3683), Ron Logan (928-333-4518), Cheri Bouch er (623-236-7615), Nara Sin (623-236-7477)

Design Team (Roles): **OEE** (Prime Consultant/Lead Designer), **WA** (Restoration Technical Advisor), **FPC** (Revegetation Design, Compliance), **WLES** (SWPPP), **CEC** (Cultural Survey)

Project Synopsis: OEE was contracted to develop a project to improve morphological/ecological diversity/complexity of the Little Colorado River by reconnecting relic floodplain channels & backwaters, adjusting the river trail to allow room for natural processes while maintaining access, stabilizing cutbanks to reduce sediment pollution, & establishing a mosaic of native vegetation to help restore river processes & build a resilient/sustaining riverscape. Construction is scheduled for FY25.

Services Provided: **[T#1]** Review Existing Data/Literature; **[T#2]** Hydrologic Assessment; **[T#3]** Morphological & Habitat Assessment, Including Surface/Groundwater & Soil Sampling; **[T#4]** Prepare Assessment Report/Conceptual Plan; **[T#5]** Construction Drawings, Plans, Specifications, & Estimates; **[T#6]** Section 404 – Jurisdictional Delineation & SWPPP; **[T#7]** Construction Administration-Bid (x2); **[ADD]** Drone Orthoimage/Video

Arlington Wildlife Area: Gila River In-Lieu Fee Restoration Project



| Assessed Habitat | Target Species | Location | Dates |
|------------------|--|--------------------|-----------|
| River & Riparian | Mesquite Bosque/Meso-Riparian Vegetation Species | Arlington, Arizona | 2016-2017 |

References: Shawn Lowery (520-609-2166), Chris Gunter (Former AGFD Engineer – Current Contact: 2011azchris@gmail.com)

Design Team (Roles): **OEE** (Prime Consultant/Lead Designer), **FPC** (Revegetation Design)

Project Synopsis: OEE was contracted to complete assessment & design services for 3,200 feet of eroding banks along the Gila River within Arlington Wildlife Area, with the goal of stabilizing the streambank using soil bioengineering techniques and mesquite bosque/meso-riparian native vegetation. Based on the site inventory and analysis the restoration team developed a holistic set of site-specific practices that could be used to mitigate against further streambank erosion from river flooding and upland stormwater flows while providing a favorable environment for native plant revegetation.

Services Provided: **[T#1]** Review Existing Data/Literature; **[T#2]** Hydrologic Assessment/Hydraulic Modeling; **[T#3]** Morphological & Habitat Assessment, Including Surface/Groundwater & Soil Sampling; **[T#4]** Prepare Assessment Report/Conceptual Plan; **[T#5]** Construction Drawings, Plans, Specifications, & Estimates **[T#6]** Environmental Compliance – SWPPP Analysis & Cost Estimate

Spring Assessments: Rudy Ronquillo Spring & Casita Spring



| Assessed Habitat | Target Species | Location | Dates |
|---|---------------------------------------|----------------------|--------------|
| Lentic/Lotic Springs, Pond, Wetland, Ephemeral Wash, Riparian | Chiricahua Leopard Frog, Sonoran Chub | Coronado NF, Arizona | 2021-Ongoing |

References: Audrey Owens (623-236-7515), Ian Latella (623-236-7378)

Design Team (Roles): **OEE** (Prime Consultant/Lead Designer)

Project Synopsis: OEE was contracted to complete assessment & conceptual design services for two spring sites in Chiricahua Leopard Frog (CLF) Recovery Area Unit 1 (RU1) in the Nogales Ranger District of Coronado National Forest. Rudy Ronquillo Spring and the associated pond support a robust population of CLF and the spring infrastructure that feeds the pond will be assessed to optimize flow and reduce maintenance. Casita Spring and the associated run have been degraded by grazing and post-fire flooding & the habitat will be assessed to improve pond/pool refugia and increase resiliency/complexity.

Services Provided/Scoped: **[T#1]** Review Existing Data/Literature; **[T#3]** Morphological & Habitat Assessment; **[T#4]** Prepare Assessment Report/Conceptual Plan **[ADD]** Drone Orthoimages/Video

Featured Arizona Game & Fish Department Projects

Wenima Wildlife Area: Restoration Master Plan



| Assessed Habitat | Target Species | Location | Dates |
|---|--|------------------------|-----------|
| River, Riparian, Wetland, Upland/Agricultural Lands | Special Status, Native Aquatic, & Other Associated Species | Springerville, Arizona | 2019-2020 |

References: Julie Carter (623-236-7576), Skyler Hedden (623-236-7509), David Dorum (928-532-3683), Ron Logan (928-333-4518)

Design Team (Roles): **OEE** (Prime Consultant/Lead Designer), **WA** (Restoration Technical Advisor), **FPC** (Revegetation Design, Compliance), **CEC** (Compliance Assistance)

Project Synopsis: OEE was contracted to develop master plan for the 355-acre wildlife area to provide a roadmap for holistically and strategically improving riverscape habitat, agricultural operations, and recreational opportunities while balancing the needs of both wildlife and constituents. The master plan provided tools to help plan, program, and leverage additional funding to achieve AGFD’s vision, including conceptual designs, cost estimates, and potential project packages.

Services Provided: **[T#1]** Review Existing Data/Literature; **[T#2]** Hydrologic Assessment; **[T#3]** Rapid/Broad Scale Morphological & Habitat Assessment; **[T#4]** [Prepare Assessment Report/Master Plan](#); **[T#6]** Section 404 Compliance – Wetland/Jurisdictional Delineation for Entire Wildlife Area; **[ADD]** [Drone Orthoimage/Video](#)

Wenima Wildlife Area: Little Colorado River Habitat Improvement Project



| Assessed Habitat | Target Species | Location | Dates |
|--------------------------|--|------------------------|-----------|
| River, Riparian, Wetland | Little Colorado Spinedace, Little Colorado Sucker, & Other Native Wildlife | Springerville, Arizona | 2019-2022 |

References: Julie Carter (623-236-7576), Sky Hedden (623-236-7509), David Dorum (928-532-3683), Ron Logan (928-333-4518), Cheri Bouch r(623-236-7615), Curt Gill(623-236-7259), Nara Sin (236-7477)

Design Team (Roles): **OEE** (Prime Consultant/Lead Designer), **WA** (Restoration Technical Advisor), **FPC** (Revegetation Design)

Project Synopsis: OEE was contracted to develop a pilot project based off the “Master Plan” for the wildlife area. The objective of the project was to improve morphological/ecological diversity/complexity of the Little Colorado River by removing a derelict 8-foot-tall agricultural levee and reconnecting a 500-foot-long historic river meander and an acre of associated floodplain to help restore river processes and build a resilient and sustaining riverscape. Construction was completed in FY22.

Services Provided: **[T#1]** Review Existing Data/Literature; **[T#2]** Hydrologic Assessment; **[T#3]** Morphological & Habitat Assessment; **[T#4]** Prepare Assessment Report/Concept Drawings; **[T#5]** [Construction Drawings, Plans, Specifications, Estimates](#); **[T#6]** Environmental Compliance/SWPPP Analysis; **[T#7]** Construction Administration – Bidding, RFI, Staking, Observation, Job Reports, Closeout; **[ADD]** Drone Orthoimage and Video (Pre/Post), [Timelapse](#), [Multimedia Project Video](#)

West Fork Black River: Fish Barrier Removal Project for Apache Trout Reintroduction



| Assessed Habitat | Target Species | Location | Dates |
|--------------------------|--|----------------------|--------------|
| River, Riparian, Wetland | Apache Trout, Loach Minnow, Roundtail Chub, Speckled Dace, Desert Sucker | Apache-Sitgreaves NF | 2021-Ongoing |

References: Zach Beard (623-236-7653), Curt Gill (623-236-7259), Julie Carter (623-236-7576)

Design Team (Roles): **OEE** (Prime Consultant/Lead Designer), **WA** (Restoration Technical Advisor), **WLES** (Aquatic Ecology - If Required) **CEC** (Environmental Compliance – If Required)

Project Synopsis: OEE was contracted to develop designs for the removal, and subsequent habitat restoration, of four non-functional fish barriers on Hayground, Home, & Stinky Creeks. The reconnection of these tributaries to the West Fork Black River will enable the establishment of a meta-population of Apache trout and provide resiliency for the species in the face of increasing threats like climate change. The removal of the barriers will also create habitat for other native target fish species. T#1, T#2, & T#3 have been initiated and final design is scheduled to be completed in December 2022.

Services Provided/Scoped: **[T#1]** Review Existing Data/Literature; **[T#2]** Hydrologic Assessment; **[T#3]** Morphological & Habitat Assessment; **[T#4]** Prepare Assessment Report/Conceptual Plan; **[T#5]** Construction Drawings, Plans, Specifications, & Estimates; **[T#6]** Section 404 Compliance (If Time/Budget Allows); **[T#8]** Fish Barrier Services

Featured Arizona Game & Fish Department Projects

Sipe White Mountain Lake Wildlife Area: Rudd Creek Habitat Improvement Project



| Assessed Habitat | Target Species | Location | Dates |
|--------------------------|--|------------------------|--------------|
| River, Riparian, Wetland | NM Meadow Jumping Mouse, LCR Spinedace, Chiricahua Leopard Frog, Other Native Wildlife | Springerville, Arizona | 2019-Ongoing |

References: Julie Carter (623-236-7576), Skyler Hedden (623-236-7509), David Dorum (928-532-3683), Ron Logan (928-333-4518), Cheri Bouch er (623-236-7615)

Design Team (Roles): **OEE** (Prime Consultant/Lead Designer), **WA** (Restoration Technical Advisor), **FPC** (Revegetation Design, Compliance Assistance)

Project Synopsis: OEE was contracted to develop a project to improve morphological/ecological diversity/complexity of the Rudd Creek corridor for target species by creating a channel and backwater complex augmented with wood & rock structures, stabilizing instream headcuts to reduce sediment pollution, & establishing a mosaic of native vegetation to help restore river processes & build a resilient/sustaining riverscape. Construction is scheduled for FY23 & FY24.

Services Provided: **[T#1]** Review Existing Data/Literature; **[T#2]** Hydrologic Assessment; **[T#3]** Morphological & Habitat Assessment, Including Surface/Groundwater & Soil Sampling; **[T#4]** Prepare Assessment Report/Conceptual Plan; **[T#5]** Construction Drawings, Plans, Specifications, & Estimates; **[T#6]** Section 404 – Jurisdictional Delineation, PCN Application, Biological Assessment; **[T#7]** Construction Administration-Bid; **[ADD]** Drone Orthoimage/Video

Haigler Creek: Fish Barrier Construction Project for Gila Trout Reintroduction



| Assessed Habitat | Target Species | Location | Dates |
|------------------|----------------|------------------------------|-----------|
| River, Riparian | Gila Trout | Upper Haigler Creek, Arizona | 2013-2020 |

References: Julie Carter (623-236-7576), Curt Gill (623-236-7259)

Design Team (Roles): **George Cathey as an employee of Natural Channel Design, Inc.** (Lead Designer: Timber Barrier), **OEE** (Technical Consultant: Barrier Alternative Analysis)

Project Synopsis: A private landowner and AGFD are interested in constructing a structure to act as a barrier to the upstream migration of non-native rainbow and brown trout while still functioning as an irrigation diversion on Upper Haigler Creek. After installation of the barrier, AGFD will renovate the upstream reach of Haigler Creek to remove non-native species and will then restock the reach with native Gila Trout.

George Cathey's Technical Contribution to the Project as an Employee of Natural Channel Design, Inc.: **[T#1]** Review Existing Data/Literature; **[T#2]** Hydrologic/Hydraulic/Fish Jump Assessment; **[T#3]** Morphological & Habitat Assessment; **[T#4]** Prepare Assessment Report/Conceptual Plan; **[T#5]** Construction Drawings, Plans, Specifications, & Estimates; **[T#8]** Fish Barrier Service – Structural Analysis/Finite Element Modeling for Timber Barrier, Technical Consultant for Alternative Analysis

Chevelon Canyon Wildlife Area: Duran Ranch In-Lieu Fee Restoration Project



| Assessed Habitat | Target Species | Location | Dates |
|---|--|----------------------|-----------|
| Wet Meadow, Meadow, Pond, Riparian, Wetland, Ephemeral Drainage | Bebb's Willow & A Variety of Native Wildlife | Apache-Sitgreaves NF | 2018-2020 |

References: Shawn Lowery (520-609-2166), David Dorum (928-532-3683), Angela Stingelin (520-609-2168)

Design Team (Roles): **OEE** (Prime Consultant/Lead Designer), **WA** (Restoration Technical Advisor), **FPC** (Revegetation Design), **CEC** (Revegetation Design/Biological Survey)

Project Synopsis: In response to Clean Water Act 404 compensatory mitigation needs within the Little Colorado River Watershed, AGFD is developing an In-Lieu Fee (ILF) restoration project on approximately 32-acres of the Duran Ranch parcel. The conceptual plan incorporates elements that will mitigate channel erosion, improve water retention, and enhance the native vegetation community within the wetland complex along the Circle Bar Draw drainage. Proposed restoration actions are expected to increase functional lift across the property and benefit numerous wildlife species including migratory birds, small mammals, amphibians and reptiles.

Services Provided: **[T#1]** Review Existing Data/Literature; **[T#2]** Hydrologic Assessment/Hydraulic Modeling; **[T#3]** Morphological & Habitat Assessment; **[T#4]** Prepare Assessment Report/Conceptual Plan/Conceptual Costs

Project Site Photos & Video



Figure 1: Little Colorado River Riverscape View - looking upstream from the north end of the project area. Note large, disconnected meadow complex/relic floodplain channels to the right of the river, and parking lot, trail, and agricultural fields to the left of the river.



Figure 2: Little Colorado River Riverscape View - looking upstream at a large beaver complex near the center of the project area. Note the proximity of the river trail on the left side of the river to flooded areas caused by beaver activities and cutbanks caused by river processes.

Project Site Photos & Video



Figure 3: Little Colorado River Riverscape View - looking downstream. Note proximity of the river trail on the right side of the river to outside meander bends and associated cutbanks, as well as agricultural tail water ditches.



Figure 4: Little Colorado River Riverscape View - looking downstream at a beaver complex near the parking lot. Note large, disconnected meadow complex/relic floodplain channels to the left of the river. Note the proximity of the river trail on the right side of the river to flooded areas caused by beaver activities and cutbanks caused by river processes.

Project Site Photos & Video



Figure 5: Extensive, active cutbank with high Bank Erosion Hazard Index (BEHI) near the parking lot.



Figure 6: Typical river cutbank with high Bank Erosion Hazard Index (BEHI). Note exposed meadow root mat near the top of the cutbank that is well above base water levels.

Project Site Photos & Video



Figure 7: River Walk trail flooded by agricultural tailwater



Figure 8: River Walk trail with erosion from nearby river cutbank exacerbated by agricultural tailwater.

Project Site Photos & Video



Figure 9: Typical beaver dam



Figure 10: Typical relic swale meandering through disconnected riparian floodplain meadows

Project Site Photos & Video



Figure 11: Typical relic swale meandering through disconnected riparian floodplain meadows



Figure 12: Disconnected near channel backwater channel/oxbow swale

Project Site Photos & Video



Figure 13: Unmanned Aerial System (UAS) flight of the Little Colorado River corridor through Becker Lake Wildlife Area April 29, 2020, flying from the northern/downstream end of the project area to the southern/downstream end of the project area.

Becker Lake Wildlife Area Little Colorado River Habitat Improvement Project

Becker Lake Wildlife Area, Apache County, AZ
AGFD Order No. PO0000284960

PROJECT NAME:
Becker Lake Wildlife Area
Little Colorado River
Habitat Improvement
Project

LOCATION:
Becker Lake Wildlife Area
Apache County, AZ

PROJECT NUMBER:
AGFD17-182274-OXBOW
Order No. PO0000284960

PROJECT PHASE:
100% Submittal
Construction Set

CLIENT/PROJECT MANAGER:
Arizona Game & Fish Department
5000 West Carefree Highway
Phoenix, AZ 85086
(602) 942-3000

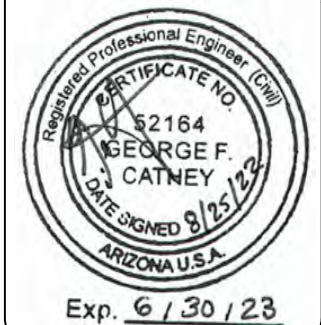
RESTORATION TECHNICAL ADVISOR:
Fred Phillips Consulting, LLC
17285 Highway 550
Ridgway, CO 81432
(928) 380-5058

RESTORATION TECHNICAL ADVISOR:
Watershed Artisans, Inc.
1000 Cordova Place #832
Santa Fe, NM, 87505
(505) 577-9625

DRAWN BY: G. Cathey

DESIGNED BY: NA

ENGINEER OF RECORD:



UNAUTHORIZED CHANGES & USES:
The engineer preparing these plans will not be responsible for, or liable for, unauthorized changes to or uses of these plans. All changes must be in writing and must be approved by the engineer of record.

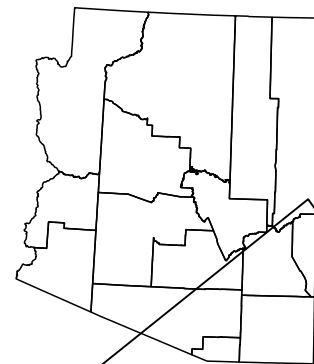
PLAN REPRODUCTION:
The plans have been created on ANSI B (11 IN. x 17 IN.) sheets. For reductions, refer to graphic scale. The plans have been created for full color plotting. Any set of the plans that is not plotted in full color shall not be considered adequate. Warning: Information may be lost in copying and/or gray scale plotting.



DATE: 8.25.22 **OEE PROJECT #:** AZ-009-6

DRAWING:
Cover Sheet

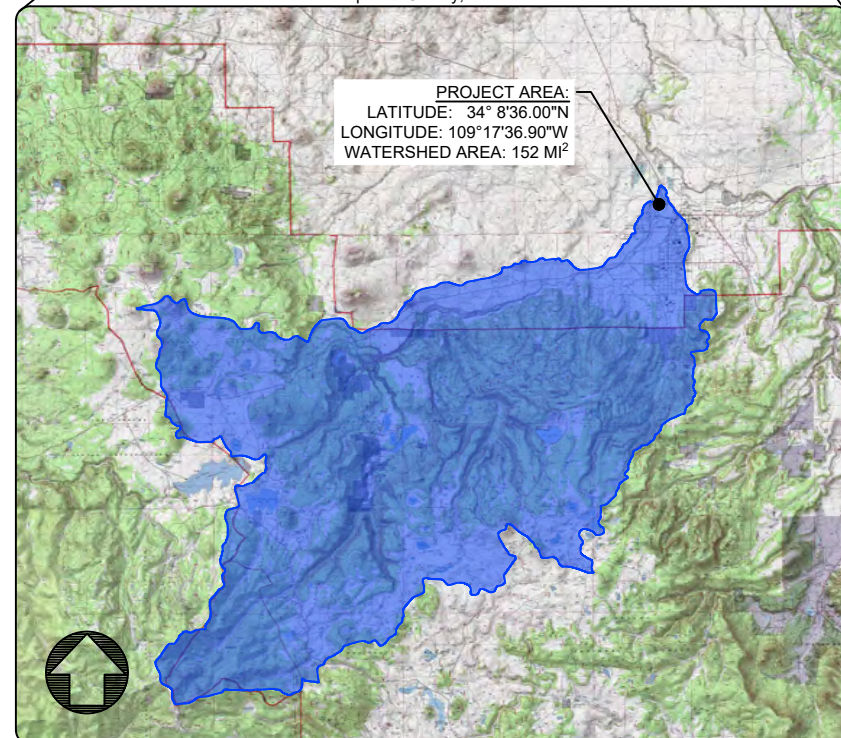
DRAWING #: CVR01 **SHEET #:** 1 OF 9 **REVISION #:** 2



VICINITY & WATERSHED MAP
Gila-Salt River Meridian
Township 9N, Range 29E, Section 29 & 32
Apache County, Arizona



Beaver Dam Complex - Little Colorado River - UAS Photo by OEE, April 29, 2020



SUBMITTED TO



CLIENT:
Arizona Game & Fish Department
5000 West Carefree Highway
Phoenix, AZ 85086
(602) 942-3000

SUBMITTED BY



ECOLOGICAL ENGINEERING DESIGN:
Oxbow Ecological Engineering, LLC
3491 S. Gillenwater Drive
Flagstaff, AZ 86005
(928) 266-6192



RESTORATION TECHNICAL ADVISOR:
Fred Phillips Consulting, LLC
17285 Highway 550
Ridgway, CO 81432
(928) 380-5058



RESTORATION TECHNICAL ADVISOR:
Watershed Artisans, Inc.
1000 Cordova Place #832
Santa Fe, NM, 87505
(505) 577-9625

SHEET INDEX

| SHEET NUMBER | DRAWING NUMBER | DESCRIPTION |
|--------------|----------------|---|
| 1 | CVR01 | Cover Sheet |
| 2 | GEN01 | Assessment Briefing, Objectives, & References |
| 3 | GEN02 | Design Element Examples |
| 4 | ENG01 | Project Overview: Access & Staging, Construction Summary, Data, & Control |
| 5 | ENG02 | Habitat Improvement Plan: Area 1 |
| 6 | ENG03 | Habitat Improvement Plan: Area 2 |
| 7 | ENG04 | Habitat Improvement Plan: Area 3 |
| 8 | DTL01 | Details: Streambank Soil Bioengineering & Earthwork |
| 9 | DTL02 | Details: Trail, Revegetation, & SWPPP |

DRAWING REVISIONS

| NUMBER | DATE | BY | REVISION DESCRIPTION |
|--------|---------|-----|-----------------------------------|
| 0 | 6.19.20 | GFC | 100% Submittal - Permitting Set |
| 1 | 3.26.21 | GFC | 95% Submittal - Bid Set |
| 2 | 8.25.22 | GFC | 100% Submittal - Construction Set |

Assessment Briefing

The following is a brief assessment of the ~ 6,400-foot long study reach of the Lower Colorado River through Becker Lake Wildlife Area (see DWG ENG01 for map):

1. Multiple meander banks within this stream channel reach have raw vertical/overhanging banks and partially formed lateral scour pools (A & B). The height of these banks relative to bankfull depth combined with steep bank angles, little or no root density or bank protection, and stratified bank soils creates a high potential for further bank erosion. Without intervention/stabilization efforts to address these impairments, these banks could become a significant source of non-point source sediment pollution.
2. The river currently traverses the eastern edge of a wide, undeveloped meadow complex. The meadow has a series of relic channels directly adjacent to the river (Photo F), but it appears that the river has limited access to these floodplain channels during frequent flood flows. Reconnecting to these floodplain features could provide flood relief to spread and slow flows while also reducing shear stress on streambanks during frequent floods.
3. Beaver activity is evident within the river corridor, with multiple large dam complexes throughout the site (Photo D, E, & F). These complexes provide multiple ecosystems services including: fish refugia, increased aquatic habitat heterogeneity, increased lateral connectivity to the floodplain, and increased area of inundation for groundwater water recharge and riparian vegetation health. The presence of the beaver and the services they provide will be considered in this habitat improvement plan.
4. The popular "River Trail" that parallels the Little Colorado River through Becker Lake Wildlife Area provides access and viewing opportunities to the public. Currently there are multiple trail locations that have been damaged by natural river processes and beaver activity (Photo A & C). The current alignment may need to be re-evaluated to provide a buffer for these natural processes to play out while maintaining access and viewing opportunities.
5. During the assessment, the agricultural field on the east side of the river was being flood irrigated and most of the tailwater was being routed directly to the river via a culvert (Photo A). Along with erosion at the culvert outlet, the tailwater had breached the ditch adjacent to the field and was flooding the trail and causing an active headcut to form on the trail edge/streambank interface (Photo C).
6. There is relatively low density of riparian vegetation present within the corridor, other than a few patches of coyote willow and narrowleaf cottonwood planted in a previous restoration project in 2002/2006 (Photo B, E, & F).

Project Goals/Objectives

The overall goal of the project is to improve morphological and ecological diversity of the Little Colorado River through Becker Lake Wildlife Area, to help build a resilient and sustaining riverscape. Specifically, the restoration objectives include:

1. Reconnect, re-contour, and enhance a series of relic floodplain channels and near stream wetland backwaters to increase the frequency of out-of-bank flows, spread and slow these frequent flood flows (\pm 2-year events), and consequently relieve pressure on streambanks throughout the river corridor. Ancillary benefits of this work include an increased area of inundation and expanded near stream wetland and backwater habitat.
2. Strategically relocate and improve the river walk trail to increase the riparian buffer and allow room for natural river processes, beaver activity, and agriculture operations to play out, while maintaining public access, viewing opportunities, and reducing maintenance.
3. Decrease the Bank Erosion Potential (BEP) of cut-banks to reduce non-point point source sediment pollution and enhance aquatic habitat diversity.
4. Establish native plant species found naturally in the watershed to increase the area of wetland and riparian habitat.
5. Improve agricultural tailwater ditches to prevent trail flooding and allow for more efficient irrigation of AGFD working lands.

Design Elements

Based on the inventory and habitat assessment for the project, the restoration team developed a set of site-specific practices that, if implemented holistically, could be used to meet the objectives outlined above. The following sheet includes examples of each restoration practice along with its potential impacts to the project objectives. The remainder of the sheets in this drawing set show the placement of these design elements within the stream corridor.

References

1. Erosion Control Field Guide, 2013, Craig Sponholtz & Avery Anderson
2. Field Guide to Forest & Mountain Plants in Northern Arizona, 2009, Judy Springer et al.
3. Hydrodynamics and Sedimentology of Concave Benches, 2012, Geoff Vietz et al.
4. Let the Water Do the Work, 2012, Bill Zeedyk & Van Clothier
5. Little Colorado River Spinedace Recovery Plan, 1994, USFWS
6. Little Colorado River Spinedace, Environmental Conservation Online System, USFWS
7. Low-Tech Process Based Restoration of Riverscapes Design Manual, 2019, Joseph M. Wheaton et al.
8. Methods for Estimating the Magnitude and Frequency of Floods in Arizona, 2014, USGS
9. Regional Relationships for Bankfull Stage in Natural Channels of the Arid Southwest, 2003, Tom Moody et al.
10. Streambank Soil Bioengineering (Part 654 National Engineering Handbook, Technical Supplement 141), 2007, NRCS.
11. Streambank Soil Bioengineering Field Guide for Low Precipitation Areas, 2002, NRCS
12. River Stability Field Guide, 2008, Dave Rosgen



A Cutbank, Irrigation Drainage, & Trail Damage



B Cutbank with High Bank Erosion Potential (BEP)



C Irrigation Drainage and Trail Flooding/Damage



D Beaver Dam Complex



E Large Beaver Dam Complex



F Relic Floodplain Channel Network



PROJECT NAME:
Becker Lake Wildlife Area
Little Colorado River
Habitat Improvement
Project

LOCATION:
Becker Lake Wildlife Area
Apache County, AZ

PROJECT NUMBER:
AGFD17-182274-OXBOW
Order No. PO0000284960

PROJECT PHASE:
100% Submittal
Construction Set

CLIENT/PROJECT MANAGER:
Arizona Game & Fish Department
5000 West Carefree Highway
Phoenix, AZ 85086
(602) 942-3000

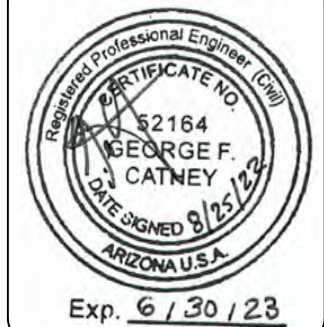
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RESTORATION TECHNICAL ADVISOR:
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1000 Cordova Place #832
Santa Fe, NM, 87505
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DRAWN BY: G. Cathey

DESIGNED BY: G. Cathey

ENGINEER OF RECORD:



UNAUTHORIZED CHANGES & USES:
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DATE: 8.25.22 **OEE PROJECT #:** AZ-009-6

DRAWING:
Assessment Briefing,
Objectives, & References

DRAWING #: GEN01 **SHEET #:** 2 OF 9 **REVISION #:** 1



1 Streambank Soil Bioengineering

Construct a floodplain bench at the outside of eroded meander bends to reduce bank erosion potential, add flood relief, and create a stable platform for dense riparian and wetland plantings. Strategically embed graded rock and boulders within the bench and toe of slope to add erosion protection and protect native plantings. Other benefits of these treatments include:

- Increase habitat and refugia for all life stages of LCRSD.
- Increase pool habitat and water depth variability.
- Increase habitat for a variety of aquatic and terrestrial macroinvertebrates, mammals, & birds.



2 Floodplain Connection & Re-Contouring

Reconnect, re-contour, and enhance a series of relic floodplain channels to help distribute and attenuate frequent flood flows (\pm 2-year events). Reconnect the river to these floodplain features with 12-15 foot wide swales with shallow side-slopes to provide flood relief and spread and slow flows while also reducing shear stress on streambanks during frequent floods. Shape existing relic channels as required to optimize floodplain and habitat function. Other benefits of these treatments include:

- Increase wetland and riparian habitat for a variety of aquatic and terrestrial macroinvertebrates, mammals, and birds.



3 Backwater Wetland Enhancement

Excavate shallow channels to connect and enhance existing saturated areas along the the river to improve habitat quality and complexity and provide flood relief.

- Increase habitat and refugia for all life stages of LCRSD.
- Increase emergent wetland habitat and saturated/nearly saturated soil conditions adjacent to perennial flowing water.
- Increase quiet backwater pool habitat and water depth variability.
- Increase habitat for a variety of aquatic and terrestrial macroinvertebrates.



4 River Trail Improvements

Strategically relocate and improve the river walk trail to provide a buffer for natural river processes, beaver and other wildlife activity, and agricultural processes. Create an elevated, multi-course, compacted trail prism, with weed barrier underlay, to improve drainage and surface conditions and reduce maintenance. Decommission abandoned sections of trail as required, and salvage/re-use drainage culverts.



5 Wood Debris: Habitat Logs & Brush Placement

Strategically place woody debris within the floodplain corridor to increase complexity and roughness. Place habitat logs and brush piles in the floodplain to add roughness and force convergent lateral flow and hydraulic variation. Other benefits of these treatments include:

- Increase habitat, cover, and refugia for all life stages of LCRSD.
- Increase habitat for a variety of aquatic and terrestrial macroinvertebrates.
- Increase loafing habitat for waterfowl.
- Provide potential tie-in points for future beaver dam activity



6 Native Revegetation: Riparian Sod & Willow Clump Transplants

Harvest and strategically plant a mosaic of native wetland and riparian vegetation to provide soil stabilization, cover, and habitat. Other benefits of these treatments include:

- Increase cover for all life stages of LCRSD.
- Increase aquatic and terrestrial habitat heterogeneity.
- Increase habitat for a variety of aquatic and terrestrial macroinvertebrates, mammals, & birds.
- Increase woody vegetation to help support future beaver dam activity.

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PROJECT NAME:
Becker Lake Wildlife Area
Little Colorado River
Habitat Improvement
Project

LOCATION:
Becker Lake Wildlife Area
Apache County, AZ

PROJECT NUMBER:
AGFD17-182274-OXBOW
Order No. PO0000284960

PROJECT PHASE:
100% Submittal
Construction Set

CLIENT/PROJECT MANAGER:
Arizona Game & Fish Department
5000 West Carefree Highway
Phoenix, AZ 85086
(602) 942-3000

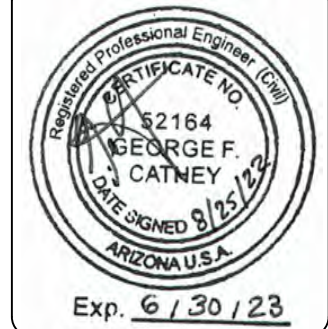
RESTORATION TECHNICAL ADVISOR:
Fred Phillips Consulting, LLC
17285 Highway 550
Ridgway, CO 81432
(928) 380-5058

RESTORATION TECHNICAL ADVISOR:
Watershed Artisans, Inc.
1000 Cordova Place #832
Santa Fe, NM, 87505
(505) 577-9625

DRAWN BY: G. Cathey

DESIGNED BY: G. Cathey, C. Sponholtz

ENGINEER OF RECORD:



UNAUTHORIZED CHANGES & USES:
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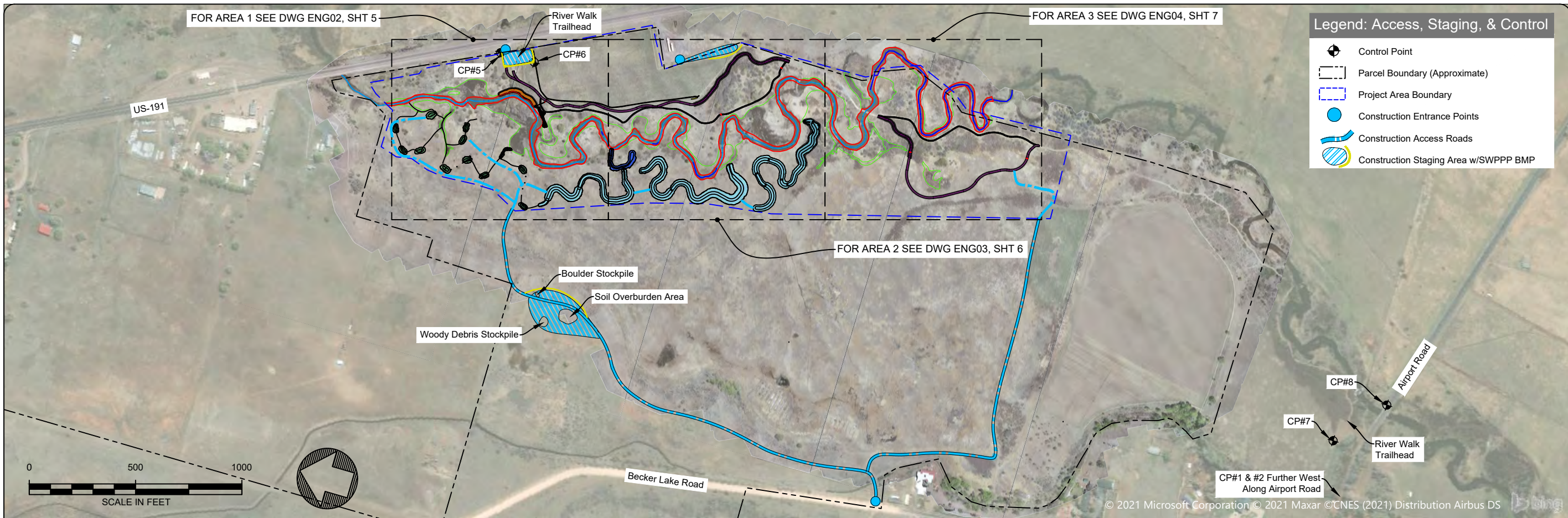
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DATE: 8.25.22 **OEE PROJECT #:** AZ-009-6

DRAWING: Design Element Examples

DRAWING #: GEN02 **SHEET #:** 3 OF 9 **REVISION #:** 1



Legend: Access, Staging, & Control

- Control Point
- Parcel Boundary (Approximate)
- Project Area Boundary
- Construction Entrance Points
- Construction Access Roads
- Construction Staging Area w/SWPPP BMP

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DRAWN BY: G. Cathey

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ENGINEER OF RECORD:

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811 Know what's below. Call before you dig.

DATE: 8.25.22 **OEE PROJECT #:** AZ-009-6

DRAWING:
Project Overview: Access & Staging, Construction Summary, Data, & Control

DRAWING #: ENG01 **SHEET #:** 4 OF 9 **REVISION #:** 2

Abbreviations

- @ AT
- AC ACRE
- APPROX APPROXIMATELY
- CC CENTER TO CENTER
- CL CENTER LINE
- CLF CHIRICAHUA LEOPARD FROG
- CP CONTROL POINT
- CY CUBIC YARD
- Ø DIAMETER
- DTL DETAIL
- DWG DRAWING
- EA EACH
- ELEV ELEVATION
- EX EXISTING
- FG FINISHED GRADE ELEVATION
- FL FLOWLINE ELEVATION
- FT FEET
- GB GRADE BREAK
- IN. INCH
- L LENGTH
- LCRSD LITTLE COLORADO RIVER SPINEDACE
- LF LINEAR FEET
- LS LUMP SUM
- MAX MAXIMUM
- M.E. MATCH EXISTING
- MIN MINIMUM
- MISC MISCELLANEOUS
- NMMJM NEW MEXICO MEADOW JUMPING MOUSE
- NO. NUMBER
- NTS NOT TO SCALE
- OC ON CENTER
- PROP. PROPOSED
- REQD. REQUIRED
- SF SQUARE FEET
- SHT SHEET
- STA STATION
- W/ WITH

Legend

- EXISTING FEATURES**
- Fenceline (Approximate)
 - Little Colorado River Thalweg
 - Major Contour @ 5 Foot Interval
 - Minor Contour @ 1 Foot Interval
 - Ordinary High Water Mark
 - Jurisdictional Wetlands
- PROPOSED FEATURES**
- View, Section, or Detail Indicator
 - Construction Note (See Below)
 - Major Contour @ 5 Foot Interval
 - Minor Contour @ 1 Foot Interval
 - Streambank Soil Bioengineering
 - Boulders
 - River Trail
 - River Trail Decommissioning
 - Culvert
 - Irrigation Ditch
 - Woody Debris
 - Floodplain Swale
 - Floodplain Depression
 - Backwater Channel
 - Brush Trimming Zone
 - Willow Clump Planting Zone

Construction Notes & Estimated Quantities

- DIVISION 100: GENERAL SPECIFICATIONS**
- 103.1 (1 LS) Fulfill General Requirements
 - 104.1 (1 LS) Mobilize & Demobilize Equipment
- DIVISION 200: EARTHWORK**
- 201.1 (4,620 CY) Floodplain Swales: Excavate, Shape, Haul, & Place
 - 201.2 (400 CY) Floodplain Depressions: Excavate, Shape, Haul, & Place
 - 201.3 (380 CY) Backwater Channels: Excavate, Shape, Haul, & Place
 - 201.4 (350 CY) Streambank Soil Bioengineering: Excavate, Shape, Haul, & Place
 - 201.5 (1,010 LF) Irrigation Ditch: Excavate, Shape, Haul, & Place
- DIVISION 300: RIVERSCAPE STRUCTURES**
- 301.1 (180 LF) Streambank Soil Bioengineering: Supply & Construct Toe Protection
 - 302.1 (1 LS) Boulders: Transport & Install
 - 303.1 (2,760 LF) River Trail: Supply & Construct
 - 303.2 (2,220 LF) River Trail: Decommission
 - 304.1 (5 EA) Culvert: Salvage, Transport, & Place
 - 305.1 (1 LS) Woody Debris: Sort, Transport, & Place
- DIVISION 400: NATIVE PLANTINGS**
- 401.1 (2.45 AC) Riparian Sodmat: Salvage/Harvest & Transplant
 - 402.1 (290 CLUMPS) Willow Clump: Salvage/Harvest & Transplant
 - 403.1 (0.50 AC) Native Seed: Supply, Broadcast, & Mulch

TABLE 1: Data Sources

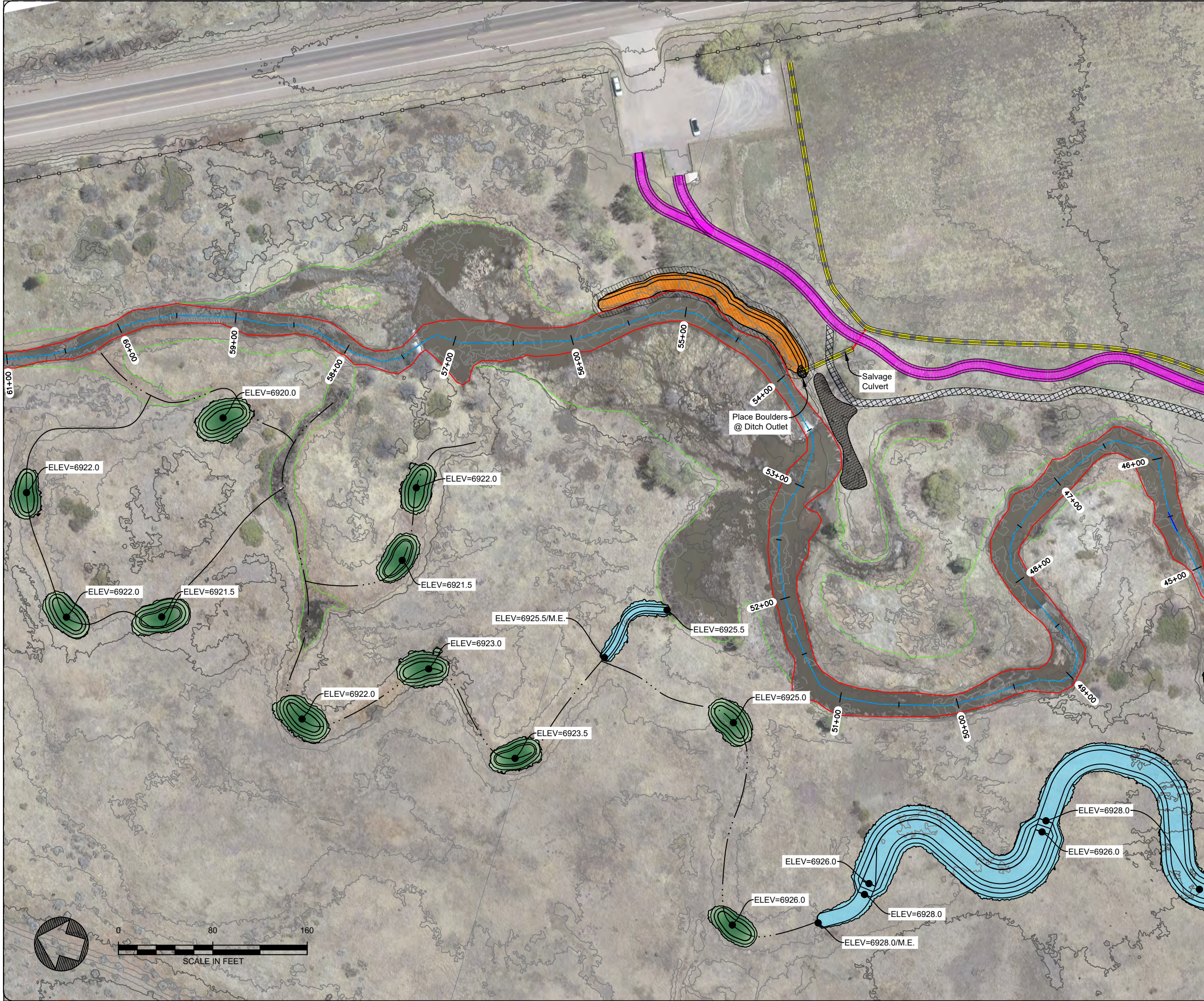
| NUMBER | TYPE | DATE | SOURCE | DESCRIPTION |
|--------|--|-----------|------------------------------|---|
| 1 | Aerial Imagery | 4/2020 | Oxbow Ecological Engineering | UAS derived digital orthoimagery |
| 2 | Topography | 4/2020 | Oxbow Ecological Engineering | Surface derived from UAS photogrammetric point cloud data |
| 3 | Topography | 6/2020 | Oxbow Ecological Engineering | Surface derived from supplemental RTK GPS survey |
| 4 | Parcel Boundary | NA | AGFD | SHP file, approximate, not the result of a boundary survey |
| 5 | Preliminary Jurisdictional Determination | 5/27/2020 | Fred Phillips Consulting | Jurisdictional Wetlands and Ordinary High Water Mark from File No. SPL-2020-00300 |

TABLE 2: Datum & Coordinate Projection Information

| | |
|-----------------------------|--------------------------------------|
| HORIZONTAL DATUM | NAD83(2011) |
| PROJECTED COORDINATE SYSTEM | ARIZONA STATE PLANE EAST ZONE (0201) |
| VERTICAL DATUM | NAVD88 |
| GEOID MODEL | GEOID18 (CONUS) |
| UNITS | INTERNATIONAL FEET |

TABLE 3: Control Points

| NUMBER | NORTHING | EASTING | ELEVATION | DESIGNATION | DESCRIPTION |
|--------|--------------|------------|-----------|-----------------------|---|
| 1 | 1,140,343.29 | 960,569.61 | 7,029.45 | PORT (PID ER0378) | AZ DOT BRASS MONUMENT |
| 2 | 1,140,338.06 | 960,534.40 | 7,029.28 | PORT RM2 (PID ER0379) | AZ DOT BRASS MONUMENT |
| 5 | 1,145,181.11 | 964,109.03 | 6,928.01 | CTCP OEE CAP | ORANGE PLASTIC CAP STAMPED WITH "OXBOW ECO ENG" |
| 6 | 1,145,016.16 | 964,111.61 | 6,928.80 | CTCP OEE CAP | ORANGE PLASTIC CAP STAMPED WITH "OXBOW ECO ENG" |
| 7 | 1,140,906.23 | 963,480.84 | 6,955.95 | CTCP OEE CAP | ORANGE PLASTIC CAP STAMPED WITH "OXBOW ECO ENG" |
| 8 | 1,140,712.19 | 963,713.70 | 6,963.46 | 121 (PID ER0377) | AZ HIGHWAY DEPT. BRASS MONUMENT |



Legend

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- Construction Note (See Below)
- Major Contour @ 5 Foot Interval
- Minor Contour @ 1 Foot Interval
- Streambank Soil Bioengineering (A/B)
- Boulders (A.3/B.8)
- River Trail (E.1/G.9)
- River Trail Decommissioning (E.1/G.9)
- Culvert (F.1/G.9)
- Irrigation Ditch (E.1/G.9)
- Woody Debris (B.1/C.8/D.8)
- Floodplain Swale (B.1/G.8)
- Floodplain Depression (C.1/G.8)
- Backwater Channel (D.1/G.8)
- Brush Trimming Zone
- Willow Clump Planting Zone (H.1/G.9)

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Project

LOCATION:
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PROJECT NUMBER:
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Order No. PO0000284960

PROJECT PHASE:
100% Submittal
Construction Set

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DRAWN BY: G. Cathey
DESIGNED BY: G. Cathey, C. Sponholtz

ENGINEER OF RECORD:

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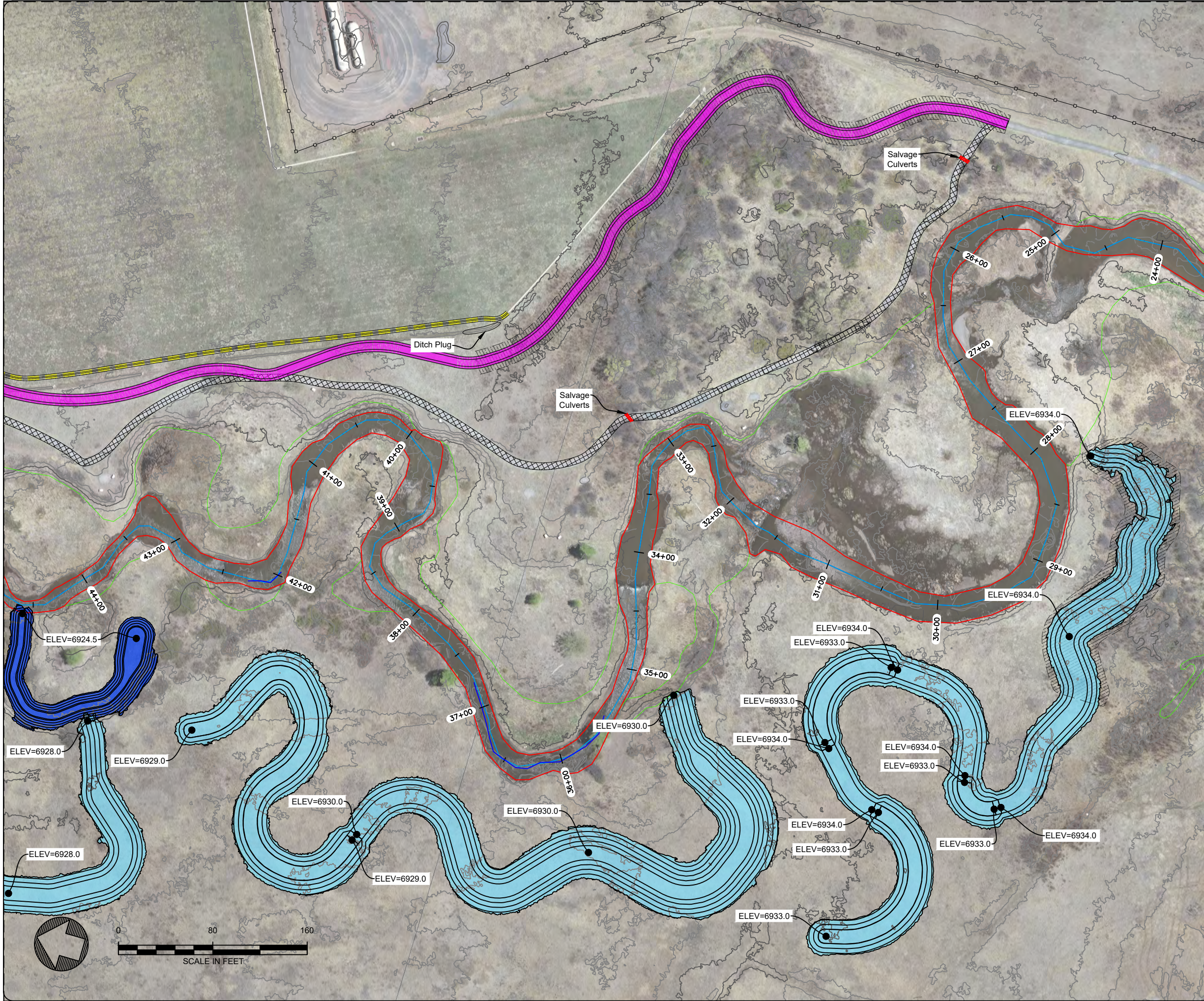
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DATE: 8.25.22 **OEE PROJECT #:** AZ-009-6

DRAWING:
Habitat Improvement Plan:
Area 1

DRAWING #: ENG02 **SHEET #:** 5 OF 9 **REVISION #:** 1



Legend

EXISTING FEATURES

- Fenceline (Approximate)
- Little Colorado River Thalweg
- Major Contour @ 5 Foot Interval
- Minor Contour @ 1 Foot Interval
- Ordinary High Water Mark
- Jurisdictional Wetlands

PROPOSED FEATURES

- View, Section, or Detail Indicator
- 103.1 Construction Note (See Below)
- Major Contour @ 5 Foot Interval
- Minor Contour @ 1 Foot Interval
- Streambank Soil Bioengineering
- Boulders
- River Trail
- River Trail Decommissioning
- Culvert
- Irrigation Ditch
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ENGINEER OF RECORD:

Exp. 6/30/23

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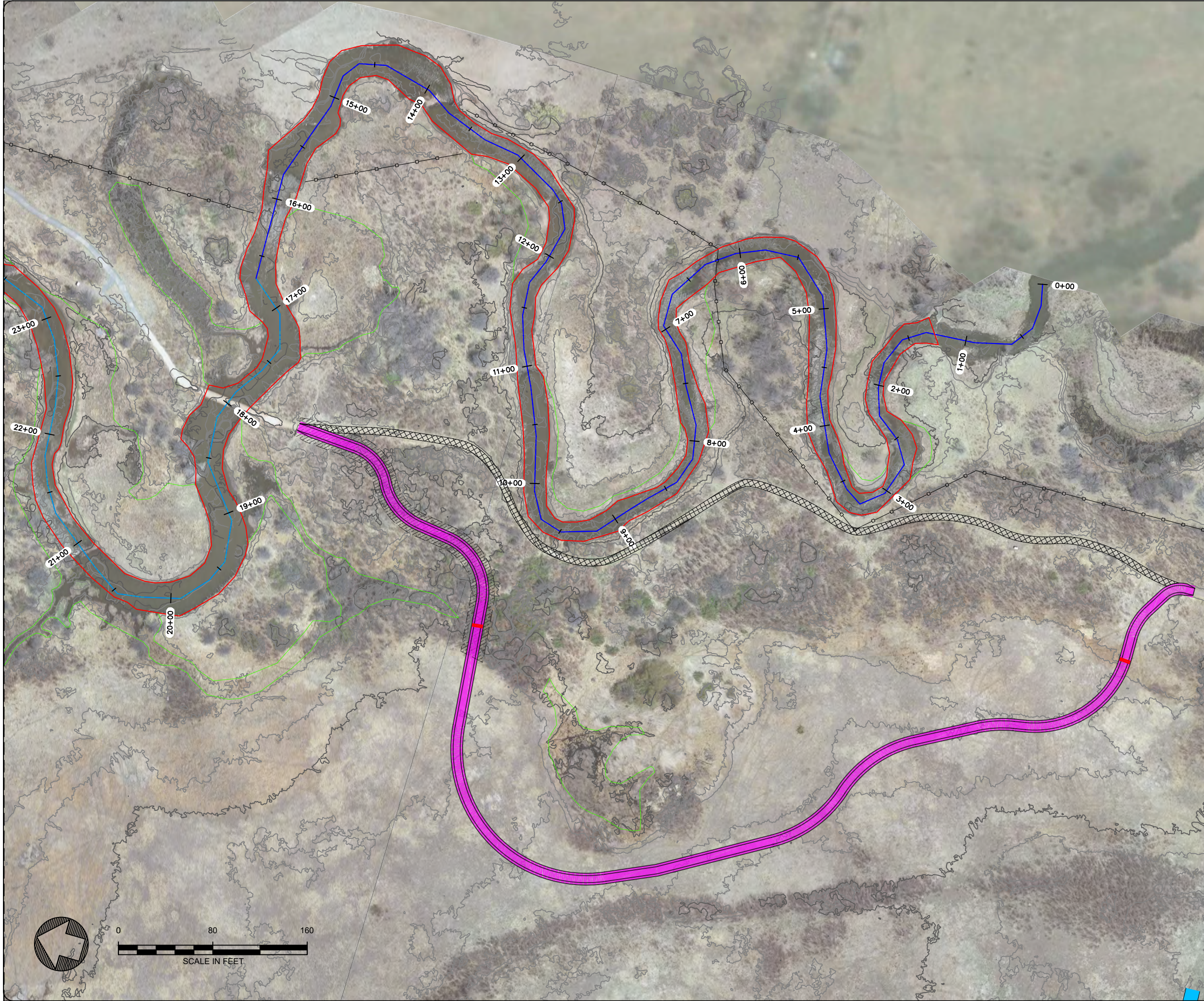
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DATE: 8.25.22 **OEE PROJECT #:** AZ-009-6

DRAWING: Habitat Improvement Plan: Area 2

DRAWING #: ENG03 **SHEET #:** 6 OF 9 **REVISION #:** 1



Legend

EXISTING FEATURES

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- Little Colorado River Thalweg
- Major Contour @ 5 Foot Interval
- Minor Contour @ 1 Foot Interval
- Ordinary High Water Mark
- Jurisdictional Wetlands

PROPOSED FEATURES

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- Construction Note (See Below)
- Major Contour @ 5 Foot Interval
- Minor Contour @ 1 Foot Interval
- Streambank Soil Bioengineering
- Boulders
- River Trail
- River Trail Decommissioning
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DATE: 8.25.22 **OEE PROJECT #:** AZ-009-6

DRAWING:
Habitat Improvement Plan:
Area 3

DRAWING #: ENG04 **SHEET #:** 7 OF 9 **REVISION #:** 1

PROJECT NAME:
Becker Lake Wildlife Area
Little Colorado River
Habitat Improvement
Project

LOCATION:
Becker Lake Wildlife Area
Apache County, AZ

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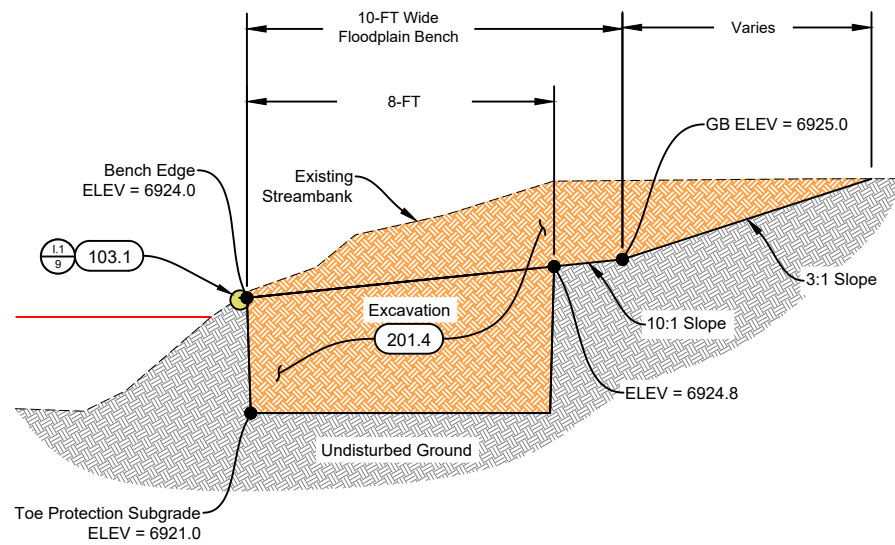
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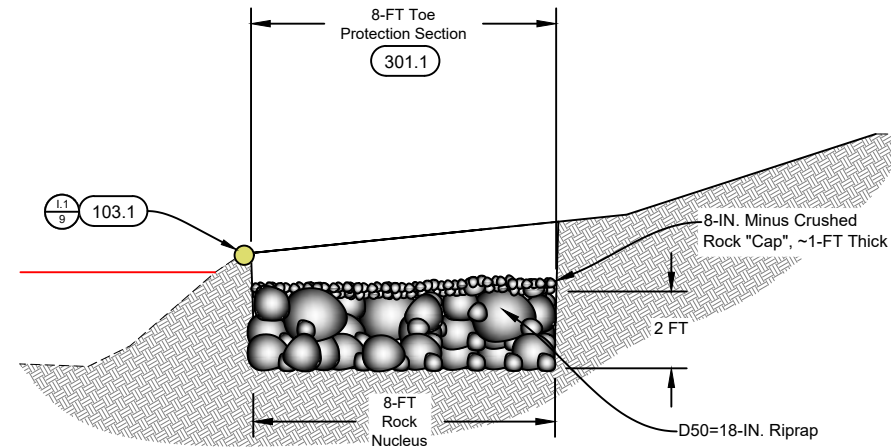
DATE: 8.25.22 **OEE PROJECT #:** AZ-009-6

DRAWING:
Details:
Streambank Soil Bioengineering
& Earthwork

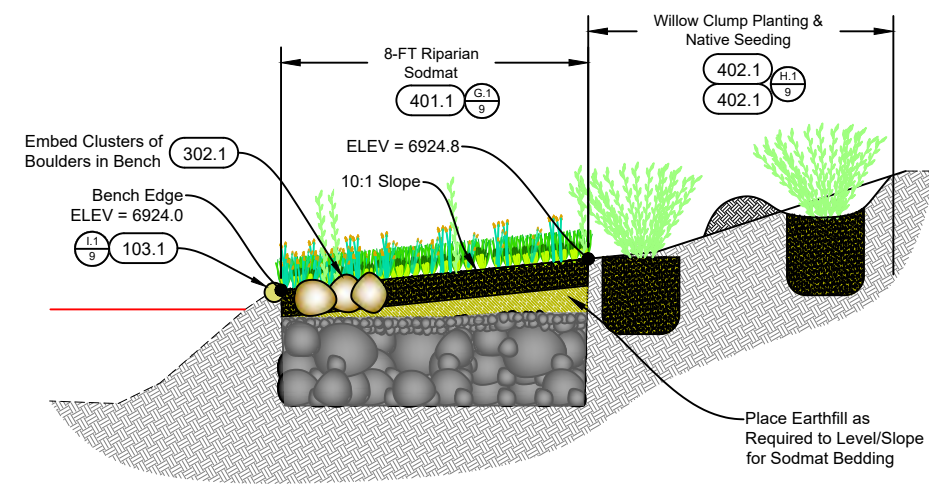
DRAWING #: DTL01 **SHEET #:** 8 OF 9 **REVISION #:**



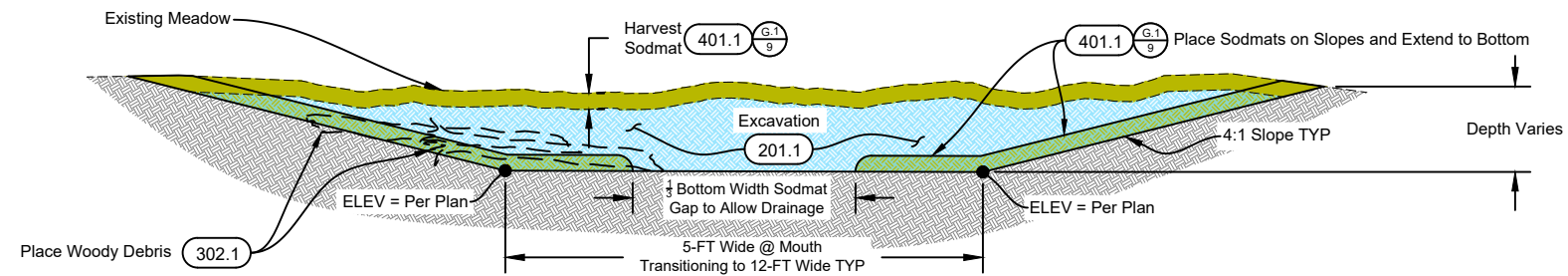
A.1 Streambank Soil Bioengineering: Earthwork
- Typical Section NTS



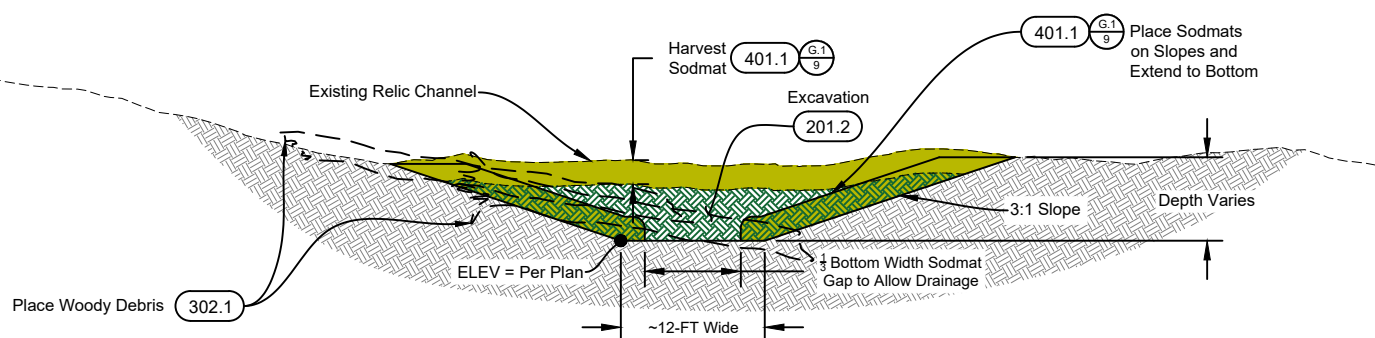
A.2 Streambank Soil Bioengineering: Toe Protection
- Typical Section NTS



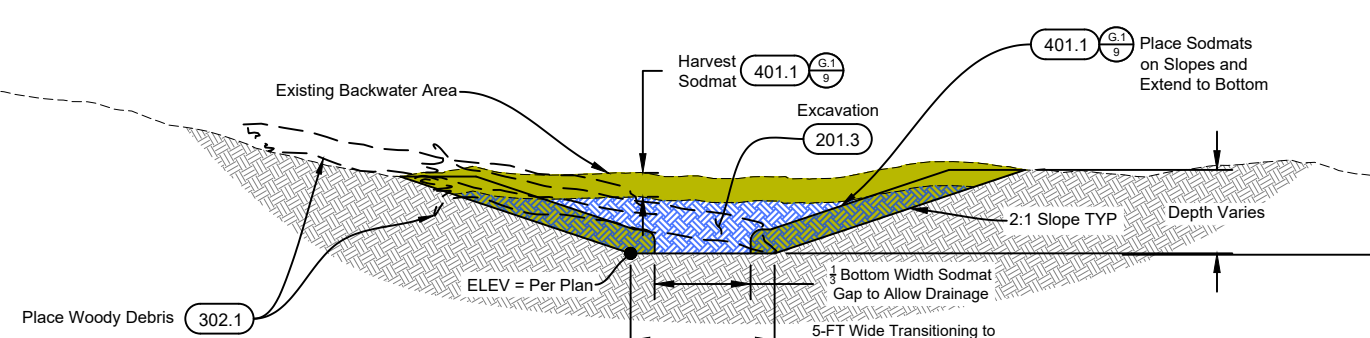
A.3 Streambank Soil Bioengineering: Revegetation
- Typical Section NTS



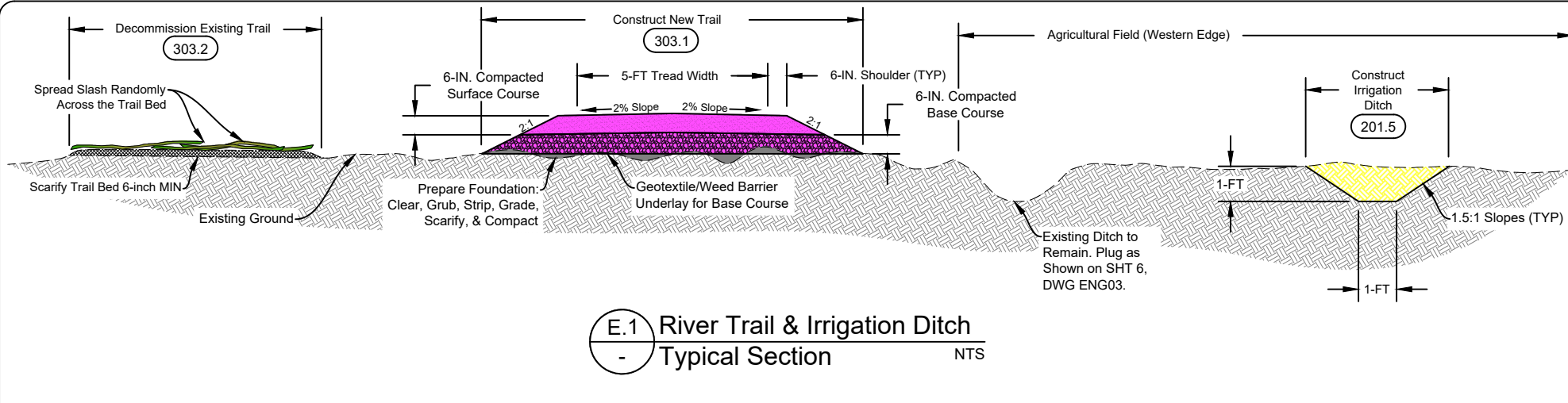
B.1 Floodplain Swale
- Typical Section NTS



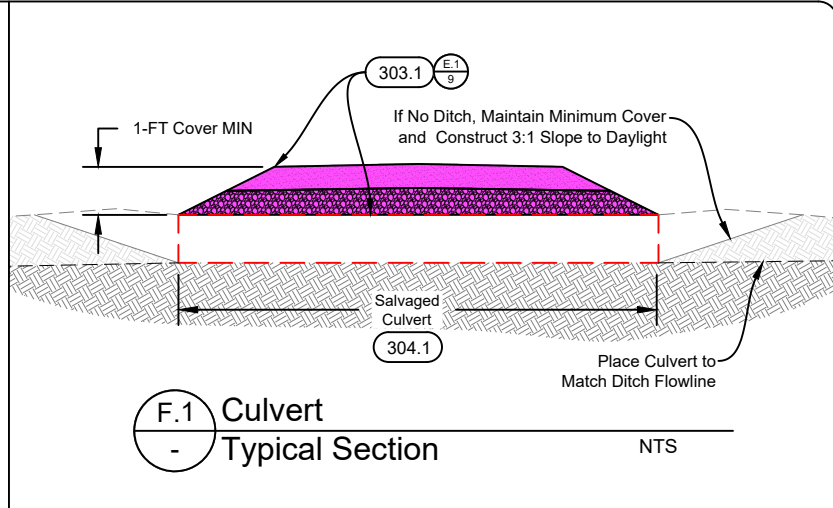
C.1 Floodplain Depression
- Typical Section NTS



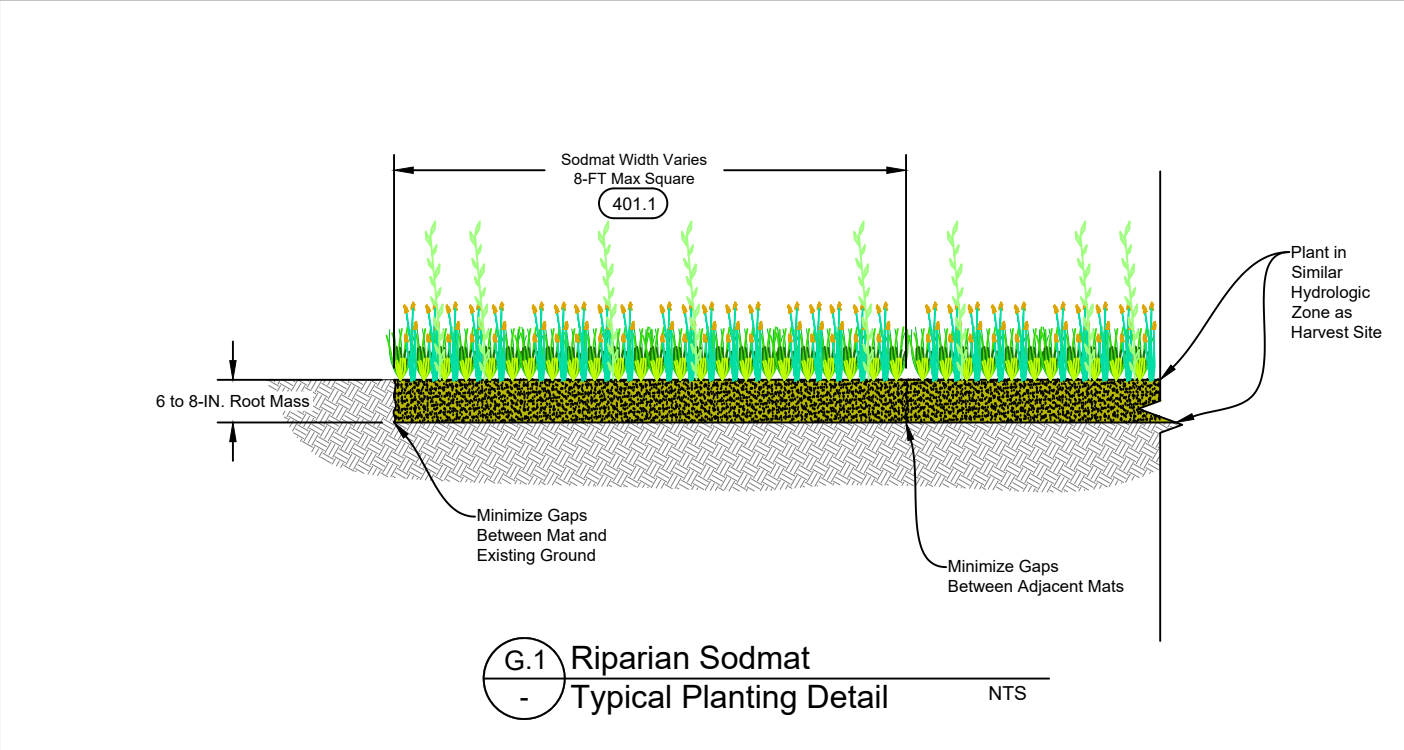
D.1 Backwater Channel
- Typical Section NTS



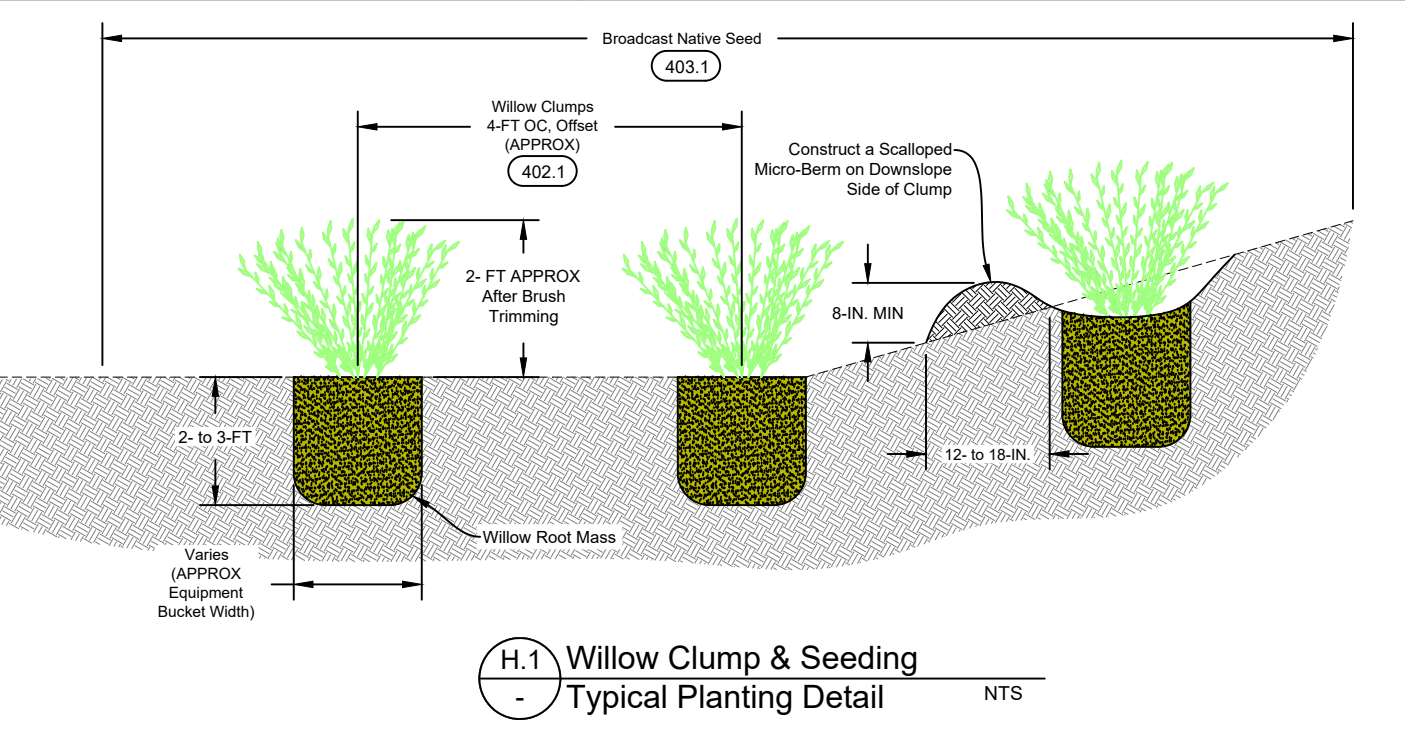
E.1 River Trail & Irrigation Ditch
- Typical Section NTS



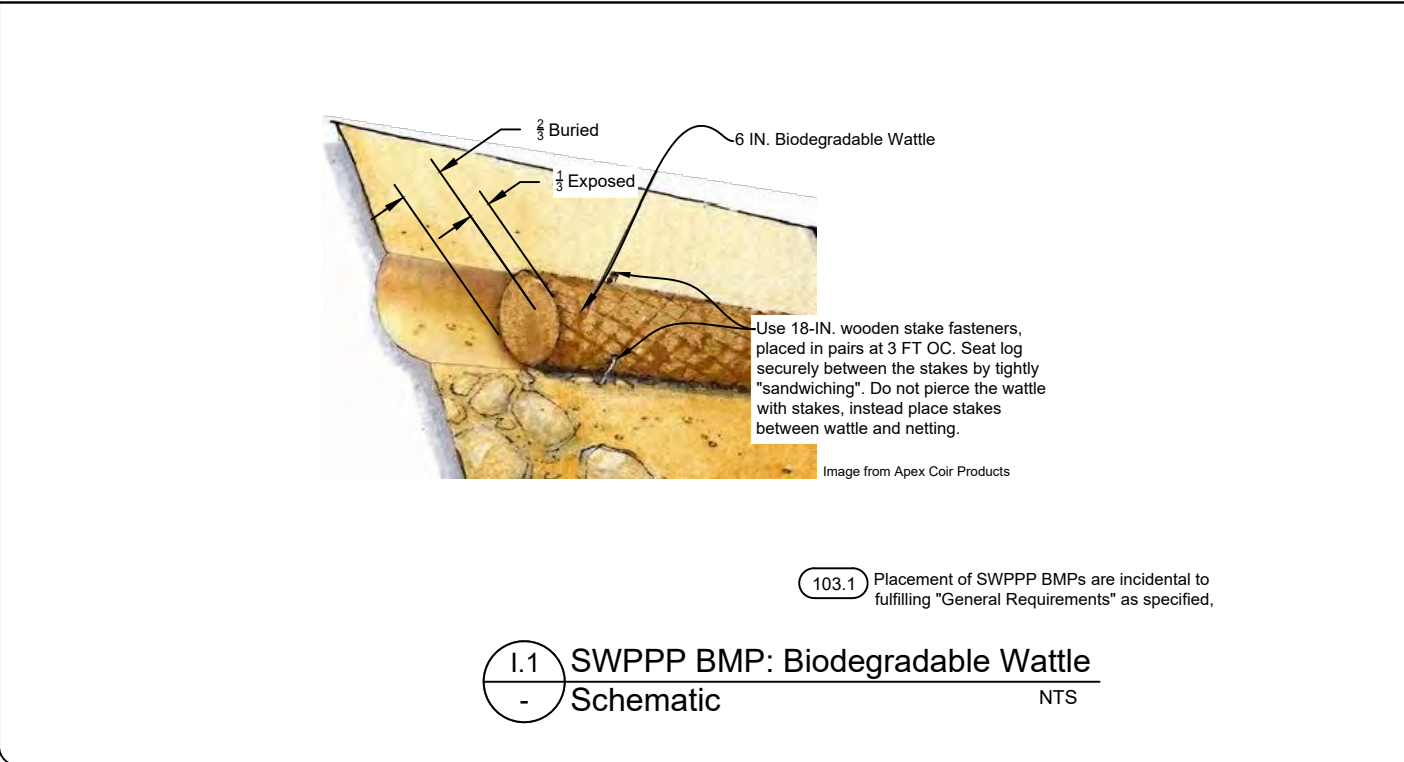
F.1 Culvert
- Typical Section NTS



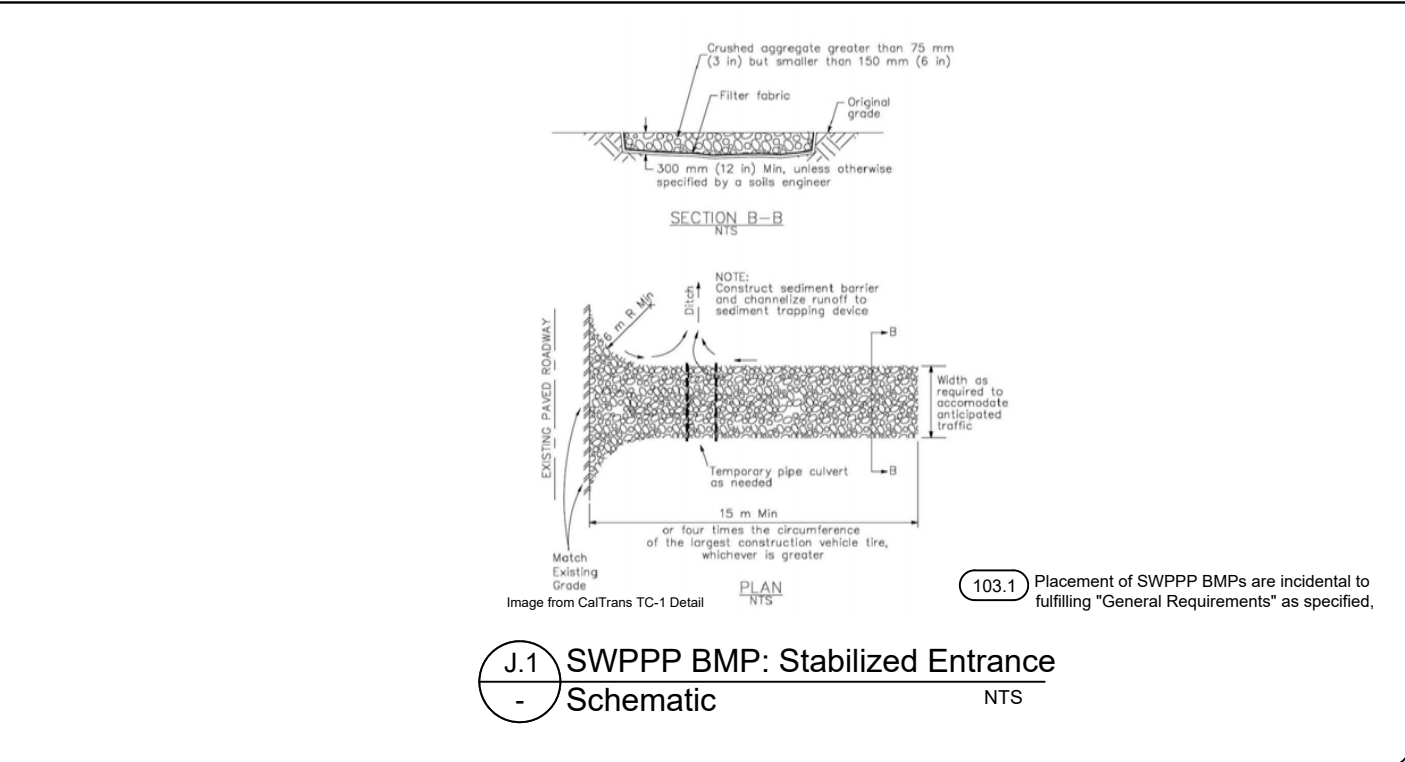
G.1 Riparian Sodmat
- Typical Planting Detail NTS



H.1 Willow Clump & Seeding
- Typical Planting Detail NTS



I.1 SWPPP BMP: Biodegradable Wattle
- Schematic NTS



J.1 SWPPP BMP: Stabilized Entrance
- Schematic NTS

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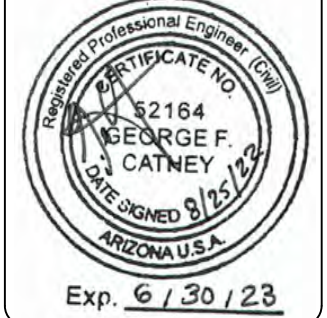
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DRAWN BY: G. Cathey

DESIGNED BY: G. Cathey

ENGINEER OF RECORD:



UNAUTHORIZED CHANGES & USES:
The engineer preparing these plans will not be responsible for, or liable for, unauthorized changes to or uses of these plans. All changes must be in writing and must be approved by the engineer of record.

PLAN REPRODUCTION:
The plans have been created on ANSI B (11 IN. x 17 IN.) sheets. For reductions, refer to graphic scale. The plans have been created for full color plotting. Any set of the plans that is not plotted in full color shall not be considered adequate. Warning: Information may be lost in copying and/or gray scale plotting.



DATE: 8.25.22 **OEE PROJECT #:** AZ-009-6

DRAWING: Details: Trail, Revegetation, & SWPPP

DRAWING #: DTL02 **SHEET #:** 9 OF 9 **REVISION #:**

Technical Specifications 100% Submittal – Construction Set



Becker Lake Wildlife Area Little Colorado River Habitat Improvement Project Becker Lake Wildlife Area, Apache County, AZ

Submitted to:



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Arizona Game & Fish
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August 25, 2022

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CERTIFICATION

PROJECT NAME: Becker Lake Wildlife Area
Little Colorado River Habitat Improvement Project

PROJECT NUMBER: PO0000284960

PROJECT LOCATION: Becker Lake Wildlife Area, Apache County, AZ

ENGINEER OF RECORD: George F. Cathey, P.E.
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DIVISION 100 GENERAL SPECIFICATIONS

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SECTION 101 – DESCRIPTION OF WORK

PART 1 - PROJECT SUMMARY

1.1 *Project Description*

The overall goal is to improve morphological and ecological diversity of the Little Colorado River through Becker Lake Wildlife Area, to help build a resilient and sustaining riverscape.

Specifically, the restoration objectives include:

1. Reconnect, re-contour, and enhance a series of relic floodplain channels and near stream wetland backwaters to increase the frequency of out-of-bank flows, spread and slow these frequent flood flows (\pm 2-year events), and consequently relieve pressure on streambanks throughout the river corridor. Ancillary benefits of this work include an increased area of inundation and expanded near stream wetland and backwater habitat.
2. Strategically relocate and improve the river walk trail to increase the riparian buffer and allow room for natural river processes, beaver activity, and agriculture operations to play out, while maintaining public access, viewing opportunities, and reducing maintenance.
3. Decrease the Bank Erosion Potential (BEP) of cut-banks to reduce non-point point source sediment pollution and enhance aquatic habitat diversity.
4. Establish native plant species found naturally in the watershed to increase the area of wetland and riparian habitat.
5. Improve agricultural tailwater ditches to prevent trail flooding and allow for more efficient irrigation of AGFD working lands.

1.2 *Project Location & Access*

The project site is located north of Spingerville, AZ within Becker Lake Wildlife Area (LATITUDE: 34° 8'36.00"N, LONGITUDE: 109°17'36.90"W).

PART 2 - MATERIALS

Not Used

PART 3 - EXECUTION

Not Used

PART 4 - MEASUREMENT AND PAYMENT

Not Used

***** END OF SECTION *****

SECTION 102 – SPECIFICATIONS & DRAWINGS

PART 1 - GENERAL

1.1 Specifications

The technical specifications are written requirements for materials, equipment, systems, standards, and workmanship as applied to the work. They also describe certain administrative requirements and procedural matters including methods of measurement and basis of payment.

1.2 Drawings

The drawings are a visual representation showing the character and scope of work to be performed, to complement the construction specifications. The drawings include location, profiles, sections, details, and notes necessary to describe the work.

1.3 Unauthorized Changes & Uses

The engineer preparing these plans will not be responsible for, or liable for, unauthorized changes to or uses of these specifications and drawings. All changes must be in writing and must be approved by the preparer of these plans.

1.4 Discrepancies, Errors, & Omissions

- A. The Engineer shall be informed of discrepancies discovered on drawings.
- B. If a conflict arises between the drawings and specifications, the specifications govern the work and/or materials unless otherwise specified.

1.5 List of Drawings

The construction drawings titled “Becker Lake Wildlife Area - Little Colorado River Habitat Improvement Project” are made a part of these specifications.

PART 2 - MATERIALS

Not Used

PART 3 - EXECUTION

Not Used

PART 4 - MEASUREMENT AND PAYMENT

Not Used

***** END OF SECTION *****

SECTION 103 – GENERAL REQUIREMENTS

PART 1 - GENERAL RESPONSIBILITIES

1.1 Definitions

- A. Landowner: The Landowner is the manager of public lands in the project area. The landowner may designate a representative that will manage the project on their behalf.
- B. Engineer: The Engineer assists the Landowner in planning, design management, and construction administration. Construction administrations services are limited to observing work and advising the landowner of the progress and quality of work and substantial conformance to the contract documents.
- C. Contractor: The Contractor has a contractual agreement with the Landowner for the project installation as set forth in the construction plan. The Contractor shall not make changes to the construction plan without review and approval by the Landowner and Engineer.

1.2 Contractor's Quality Control

It is the intent of these specifications and the construction plans that the work performed under the contract shall result in a complete operating system in satisfactory working condition with respect to the functional purpose of the installation, and no extra compensation will be allowed for anything omitted but fairly implied. The prices paid for various items in the bid shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and doing all work necessary to complete the finished product as provided in the plans and specifications.

The statement "or equal" in these specifications shall mean that the Contractor may substitute another manufacturer's product as a substitute for that specified. The Contractor will thereby warrant that the product will perform as good as or better than that replaced. The statement "or approved equal" in these specifications shall mean that the Contractor must submit information and obtain prior approval from the Engineer before making a substitution. Acceptance as equal by the Engineer does not relieve the Contractor of responsibility for the performance of the substitute product.

Where the contract requires that materials or equipment be provided or that construction work be performed, and detailed specifications of such materials, equipment, or construction are not set forth, the Contractor shall perform the work using materials and equipment of a quality comparable to the materials and workmanship specified for other parts of the work and at least equal to the general standard of quality found within existing work, from firms of established good reputations, and shall follow best practices in the performance of construction work. All equipment and materials to be incorporated into the work shall be stored in a manner to prevent damage from the elements, work, or handling. No damaged or deteriorated materials will be accepted. The work performed shall be in conformity and harmony with the intent to secure the best standard of construction and equipment of work as a whole or in part.

1.3 Construction Schedule

Prior to Construction, the Contractor shall submit to the Landowner a critical path schedule that is detailed enough to reasonably allow the Landowner and Engineer to follow the progress of the work. The schedule shall be updated periodically as required by the work and as requested by the Landowner.

1.4 Priority of Work & Coordination

The Contractor shall prioritize and order construction to meet the contract requirements. The Contractor shall prioritize and schedule aspects of work in such a manner that access to work site locations is closely coordinated in conjunction with other contractors who might be working at the site and ongoing operations and maintenance activities at the site and surrounding lands.

1.5 Laws & Regulations

Treatments and/or measures shall be designed and installed in accordance with all applicable local, state, tribal, and federal laws, and regulations. Laws and regulations of particular concern include those involving water rights, land use, pollution control, property easements, wetlands, preservation of cultural resources, and endangered species. The landowner is responsible for securing necessary permits, complying with all laws and regulations, and meeting legal requirements applicable to the installation and operation, and maintenance of this practice and associated structures. All permits acquired by the Landowner will be made part of the Contract documents and the Contractor shall abide by the requirements of those permits. All additional local, state, and federal permits and authorizations that are applicable to the construction and/or operation shall be obtained prior to construction by the Contractor.

1.6 Submittals

The Contractor shall be responsible for providing submittal information for approval as required in these specifications to the Engineer before purchasing the material or performing the work. The Engineer will review and approve or reject initial submittals in writing within 7 working days after receipt. Where the Engineer requests additional information or rejects an initial submittal, the Engineer shall use such time as is necessary to review the additional materials or new submittals. Approval of this information shall not relieve the Contractor of his/her responsibility to meet the requirements of the Contract.

1.7 Supervision of Construction and Workers

The Contractor shall supervise and direct the work using his best skill and attention. The Contractor shall be solely responsible for all construction means, methods, techniques, sequences, and procedures and for coordinating all portions of the work under the Contract. The Contractor shall also designate a person(s) to be the Contractor's representative/superintendent on site. The superintendent will serve as the project contact person and will represent not only the Contractor but also any subcontractors used on the project. The superintendent shall be responsible for requesting inspection, notifying the Landowner and Engineer when segments of the work are complete, and communication of instructions to all employees and subcontractors on the job site. Except in emergency situations all specified notifications, submittals, and communications shall be considered valid only if they are received by the Landowner and Engineer from the designated superintendent.

Any person employed by the Contractor who, in the opinion of the Landowner and/or Engineer, does not perform his work in a proper skillful manner, or is disrespectful, intemperate, disorderly, or otherwise objectionable, shall by written request (detailing reasons) of the Landowner and/or Engineer to the Contractor be removed from the work site by the Contractor employing the person, and that person shall not be employed again on any portion of the said work.

1.8 Progress Meetings

Before starting any construction, a meeting shall be held with the Landowner, Contractor, Subcontractors, and the Engineer to plan and coordinate the schedule of construction and to review intent of contract documents. The Contractor shall hold progress meetings on the site with the Landowner and/or Engineer, to discuss job-related problems. Persons designated by

the Contractor to attend and participate in the meetings shall have all required authority to commit the Contractor to solutions agreed upon in the project meeting.

1.9 Inspection and Testing

Where the Contractor has reached a point in construction where inspection is required to proceed, as designated in these technical specifications, they will provide a minimum of 72 hours' notice to the Landowner before demobilizing equipment that may be necessary to adjust or modify the work in question. The Landowner will make every effort to provide inspection on shorter notices. Regardless of any test results, the Contractor is solely responsible for the quality of workmanship and materials and for compliance with the requirements of the contract documents. The Contractor shall, without charge, replace or correct work or materials found not to conform to the contract requirements. The costs of all retests may be deducted from monies due, or to become due the Contractor.

1.10 Construction Observation

The undertaking of periodic site visits by the Engineer shall not be construed as supervision of actual construction; nor make him or her responsible for construction means, methods, techniques, sequences, or procedures; nor make him or her responsible for providing a safe place for the performance of work by contractors or contractor's employees, or those of suppliers or subcontractors, or for access, visits, use, work, travel, or occupancy by any person.

PART 2 - GENERAL SAFETY & PROTECTION

2.1 Construction Site-Safety

The Contractor shall be responsible for initiating, providing, maintaining, and supervising all safety programs and precautions in connection with the work in accordance with federal, state, and local laws and regulations and with generally accepted safety practices. The Contractor shall provide protection devices including barricades, fencing, warning signs, lights, and other devices necessary to ensure security and safety within the project site during all aspects of the Work. The Contractor shall ensure access and safety are maintained continuously during the performance of the Work.

2.2 Site Access & Infrastructure Protection

When crossing adjacent properties, the Contractor shall confine his activity to only access roads indicated on the Plans, unless otherwise specified by the Landowner. The Contractor's use of the project site shall be limited to its construction operations. The Contractor shall minimize disturbance outside the construction limits, and not unnecessarily disturb land on or adjacent to the site. Haul routes and areas of disturbance may be limited at the Landowner's discretion.

It shall be the Contractor's responsibility to determine and verify the location of existing utilities before commencing any work in the vicinity. The Contractor shall indemnify and save harmless the Landowner and Engineer from and against all claims, actions, suits, demands, damage, or costs howsoever arising because of any damage to existing utilities.

The Contractor shall be responsible for all damage and/or restoration of roads whether existing, constructed, public or private, used in conjunction with the construction of a project. All roads shall be returned to a condition equal or better to that existing prior to their use in construction of the project. Repair and or restoration work of roads shall be at the expense of the Contractor.

Any existing fencing dismantled or removed by the Contractor to accommodate the construction or access to site shall be replaced or rebuilt to its original condition prior to the Contractor leaving the site. Before any dismantling or removing of fence on private property, the Contractor

shall get written permission from the local landowner of that property. All costs incurred for this dismantling or removing shall be borne entirely by the Contractor.

2.3 Protection of Cultural & Historical Resources

If any cultural or historic resources (artifacts) are found during construction, all work shall immediately cease, and Contractor shall notify the Landowner. Landowner shall determine whether to continue or cease construction activities as appropriate and shall inform the Contractor of his decision. Contractor will be compensated for work completed to the point of cessation of activities. Any additional claims will be reviewed by the Landowner.

2.4 Protection of Habitat & Wildlife

The project site and adjacent areas contain habitat areas for wildlife. The Contractor shall provide protection, operate temporary facilities, and conduct construction in ways and by methods that: 1) comply with environmental regulations, 2) adhere to special provisions and/or permits included in the Contract, 3) protect wildlife and water quality, and 4) minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects. Wildlife or plant life shall not be intentionally harmed and destroyed.

2.5 Fire Prevention & Protection

The Contractor shall take all necessary precautions to prevent grass, brush, and forest fires. The Contractor shall be responsible for all damage from fires due directly or indirectly to his/her own activities or to those of his subcontractors or employees.

2.6 Protection of Existing Vegetation

Contractor shall take precautions to protect trees and other vegetation not intended to be removed. Vegetation designated to remain undisturbed shall be protected from damage throughout the entire construction period. The Contractor shall repair any damage resulting from the Contractor's operations or neglect. The contractor is required to notify and coordinate with Landowner prior to removing trees or vegetation and all efforts will be made to preserve standing live trees not directly in the way of improvements.

Spoil, stockpiling of materials, vehicular parking, and excessive foot or vehicular traffic shall not be allowed within the dripline of vegetation designated to remain in place. Vegetation damaged by any of these, or similar actions shall be replaced with viable vegetation of the same species or as specified in the plans and approved by the Landowner. All roots 1 inch or larger in diameter that are cut, broken, or otherwise severed during construction operations shall have the end smoothly cut perpendicular to the root. Roots exposed during excavation or other operations shall be covered with moist earth and/or backfilled as soon as possible to prevent them from drying.

PART 3 - CONTROL OF WORKS

3.1 Site Layout and Control

The Contractor is responsible for and shall perform all surveys and measurements required to accurately layout and control work as shown on the plans. The Engineer will provide pertinent CAD files and coordinate closely with the contractor, at the Contractor's request, to aid in laying the site out. Vertical and horizontal control for the project site is shown in the plans. The Contractor shall assume full responsibility for dimensions and elevations measured from such stakes and for verifying the location and elevation of the construction elements. The Contractor shall be responsible for the preservation of temporary benchmarks, stakes, and identified survey pins, and the cost of replacement if disturbed.

3.2 Pollution Prevention & Control

Construction activities shall be carried out in such a manner and sequence that erosion, air, and water pollution are minimized and held within legal limits, utilizing standard Best Management Practices (BMP's). The Contractor shall comply with all requirements of the environmental permits. All pollution prevention measures, and temporary works shall be adequately maintained in a functional condition for the duration of the construction period. All temporary measures shall be removed, and the site stabilized and restored to near original condition.

3.3 Site Maintenance

The Contractor shall keep the work site, and areas beyond the construction area affected by construction operations, in a neat and orderly condition at all times. Care shall be taken to prevent excessive soil erosion by either wind or water. Waste materials, rubbish, mud, gravel, and other debris shall be promptly and regularly removed from the site by the Contractor. Upon completion of the work, the Contractor shall promptly remove all remaining materials, rubbish, litter, debris, temporary structures, excess materials, and plants, and shall clean up the site and works to the satisfaction of the Landowner and Engineer.

3.4 Traffic Control

The Contractor shall obtain and comply with all road permits issued by all agencies having jurisdiction over the roads used. The Contractor shall make proper provisions for maintaining traffic on roads. The Contractor shall minimize disruption to all highways and adjacent road traffic. Vehicular and pedestrian traffic shall not be stopped, restricted, or diverted except when specified in the Contract documents.

3.5 Surface & Subsurface Water Control

The Contractor is responsible for the control of surface water, subsurface water, and drainage during the construction period. Because of the project site's proximity to a perennial stream channel, the Contractor should anticipate encountering groundwater during excavation operations, but subsurface conditions may vary, depending on actual soil and groundwater conditions. The Contractor shall provide dewatering and/or diversion provisions that allow drainage from the work site during construction and allow the proper construction and installation of items listed in Division 200, 300, & 400 of this specification. All temporary fills, crossings, culverts, or other facilities necessary to promote drainage will be installed and removed at the Contractor's expense prior to acceptance of the work. Any claims arising from upstream or downstream damages because of the construction or failure of these temporary works will be the Contractor's responsibility.

PART 4 - MEASUREMENT AND PAYMENT

[103.1] Fulfill General Requirements and related activities outlined in this specification shall be measured and paid on a lump sum basis (LS) for the entire project. Compensation for any item of work described in the contract, but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in the plans and these specifications.

***** END OF SECTION *****

SECTION 104 – MOBILIZATION & DEMOBILIZATION

PART 1 - GENERAL

1.1 Description

The work shall consist of mobilizing equipment, supplies and securing bonds necessary to do the work as stated in the contract and/or agreement and demobilization of excess materials and equipment from the work site.

1.2 Scope of Work

- A. Mobilization: Mobilization shall include all activities and associated costs for transportation of Contractor's personnel, equipment, and operating supplies to the site; establishment of offices, buildings, temporary restroom facilities and other necessary general facilities for the Contractor's operations at the site; premiums paid for performance and payment bonds including coinsurance and reinsurance agreements as applicable; and other items specified in the plans.
- B. Demobilization: Demobilization shall include all activities and costs for transportation of personnel, equipment, and supplies not required or included in the contract from the site; including the disassembly, removal, and site cleanup of offices, buildings, and other facilities assembled on the site specifically for this contract.

PART 2 - MATERIALS

Not Used

PART 3 - EXECUTION

All mobilization and demobilization will be performed in a safe and orderly manner with particular care not to damage existing vegetation or undue disturbance to the ingress-egress route. Ingress and Egress routes to the project sites will be identified during the project "Walk Through." When specific routes are identified, the Contractor shall avoid traveling over other areas. Unless otherwise approved by the Landowner, mobilization operations shall commence no later than one week after the notice to proceed. De-mobilization shall be finished within two weeks after substantial project completion.

During all operations, the Contractor is responsible for maintaining public and private property in original condition. Damage to existing roadways and roadway shoulders shall be repaired to the satisfaction of the authorized representative at the Contractor's expense.

PART 4 - MEASUREMENT AND PAYMENT

[104.1] Mobilize & Demobilize Equipment shall be measured and paid on a lump sum basis (LS) for the entire project. 50% of the contract unit price shall be paid at the first billing. The remaining 50% of the contract unit price shall be paid at project completion.

A Contractor is eligible for a separate mobilization payment when the Contractor is required to discontinue work by the Landowner for reasons other than seasonal termination of work. The payment shall be payment in full for supply of all necessary labor, equipment, and materials to perform mobilization operations herein described and all work in this specification. The payment shall be commensurate to the amount of equipment and materials that are required to be removed from the project site and that payment shall not exceed the original unit price specified for mobilization.

*** END OF SECTION ***

DIVISION 200 EARTHWORK

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SECTION 201 – EXCAVATION

PART 1 - GENERAL

1.1 *Description*

This work shall include the supply of all labor, materials, and equipment required to complete site excavation and shaping, and hauling and spreading as shown on the plans and to the requirements of this construction specification.

1.2 *Scope of Work*

- A. Excavate and shape floodplain swales and depressions.
- B. Excavate and shape backwaters.
- C. Placement of materials into designated earthfill areas.
- D. Leveling and trimming of earthfill areas.
- E. Dispose of unsuitable or surplus material.

1.3 *Inspection*

The Contractor shall stop work and call for inspection at the following points of construction:

- A. Upon discovery of any archaeological artifacts

PART 2 - MATERIALS

2.1 *Native Soil*

Native fill is composed of natural earth materials that can be placed and compacted by construction equipment, hand tamping, manually directed power tampers or vibrating plates, or their equivalent operated in a conventional manner. On site soils consist of alluvial deposits and loam. All fill material shall be collected from excavation and shaping activities. The selection, blending, routing, and disposition of material in the various fills shall be subject to approval by the Engineer.

PART 3 - EXECUTION

3.1 *Site Preparation*

Prior to any earthwork activities commencing, the site shall be prepared as follows:

- A. SWPPP BMP's shall be placed in accordance with **Section 103 General Requirements**.
- B. The designated "Brush/Tree Trimming Areas" shall be prepared in accordance with **Section 103 General Requirements and associated Environmental Compliance Documents**.
- C. The areas designated for "Floodplain Swale", "Floodplain Depression", and "Backwater Channel" excavation shall be prepared in accordance with **Section 401 Riparian Sodmat Plantings**.

3.2 *Excavation & Shaping*

Upon completion of site preparation activities work items shall be excavated and shaped to the lines and grades shown on the plans. Excavated shall be placed in the designated "Soil Overburden Area". Areas that have been over-excavated shall be replaced with suitable materials compacted to a density at least equal to that of the in-situ material or to the satisfaction of the Engineer.

3.3 *Finish Grading*

All finished surfaces shall be generally smooth and blend into surrounding terrain. All areas disturbed by the Contractor during construction operations shall be bladed smooth, shaped, and compacted. The construction, maintenance, and removal of all haul roads shall be the responsibility of the Contractor and be considered incidental to the work.

PART 4 - MEASUREMENT AND PAYMENT

[201.1] Floodplain Swales: Excavate, Shape, Haul, & Place

[201.2] Floodplain Depressions: Excavate, Shape, Haul, & Place

[201.3] Backwater Channels: Excavate, Shape, Haul, & Place

[201.4] Streambank Soil Bioengineering: Excavate, Shape, Haul, & Place

These items shall be measured and paid on a cubic yard (CY) basis as determined from the plans. The excavation quantity is the bank-run/natural in-place volume of soil determined by the design plan and cross sections, and therefore includes no shrink or swell factors. The unit price bid for excavation shall include supplying all materials, equipment, labor, and any incidental items necessary for performing all excavation operations and associated disposal of surplus/overburden materials described in this specification. Dewatering or the control and drainage of surface/sub-surface shall be considered incidental to excavation operations and no separate payment will be made. Building, maintaining, and removal of temporary roads and haul routes shall be considered incidental to those operations and no separate payment will be made.

[201.5] Irrigation Ditch: Excavate, Shape, Haul, & Place shall be measured and paid on a linear foot (LF) basis as determined from the plans. The excavation quantity is the bank-run/natural in-place volume of soil determined by the design plan and cross sections, and therefore includes no shrink or swell factors. The unit price bid for excavation shall include supplying all materials, equipment, labor, and any incidental items necessary for performing all excavation operations and associated disposal of surplus/overburden materials described in this specification. Dewatering or the control and drainage of surface/sub-surface shall be considered incidental to excavation operations and no separate payment will be made. Building, maintaining, and removal of temporary roads and haul routes shall be considered incidental to those operations and no separate payment will be made.

***** END OF SECTION *****

DIVISION 300 RIVERSCAPE STRUCTURES

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SECTION 301 – TOE PROTECTION

PART 1 - GENERAL

1.1 Description

The work shall include the supply of all labor, material and equipment required to complete the construction of bioengineered streambank toe sections.

1.2 Scope of Work

- A. Construct toe protection for streambanks

PART 2 - MATERIALS

2.1 Crushed Bedding

The Contractor shall supply all crushed rock required for constructing toe protection. Rock shall be approximately 8-inch minus consisting of clean crushed rock, sand and fines as is available from local sources.

2.2 Graded Rock Riprap

Graded rock riprap shall be obtained from local sources, as approved by the Engineer, or authorized representative. Individual rock fragments shall be dense, sound, and free from cracks, seams, and other defects conducive to accelerated weathering. The rock shall be angular to sub-rounded in shape. The least dimension of an individual rock fragment shall be not less than one-third the greatest dimension of the fragment. All erosion protection rock shall be composed of hard, durable, angular, sound pieces having a specific gravity of not less than 2.6 per ASTM C127. Rounded rocks and cobbles shall not be used. Rock sizing will vary between different structures due to the forces exerted on them by flows.

At least 30 days before rock is delivered from other than designated sources, the contractor shall designate, in writing, the source from which rock material will be obtained and provide information satisfactory to the Landowner that the material meets contract requirements. The Contractor shall provide the Landowner and authorized representatives free access to the source for the purpose of obtaining samples for testing.

The following table summarizes the different rock gradations for the project:

| Percent Passing by Weight | Graded Rock Riprap: Median Axis Dimension (inches) |
|------------------------------|---|
| D ₁₀₀ | 30 |
| D ₈₅ | 24 |
| D ₅₀ | 18 |
| D ₃₀ | 15 |
| D ₁₅ | 12 |

PART 3 - EXECUTION

3.1 Subgrade Excavation

The streambank shall be excavated to the subgrade of the toe protection section accordance with **Section 201 Excavation** and the construction drawings.

3.2 Placement of Rock

The graded rock riprap and boulder “nucleus” shall be installed to the full course thickness in one operation and in such a manner as to avoid serious displacement of the underlying material. The rock shall be delivered and placed in a manner that ensures a reasonably

homogeneous surface with the larger rocks uniformly distributed and firmly in contact one to another with the smaller rocks and spalls filling the voids between the larger rocks. All rock shall be placed such that finished rock surfaces conform to the plan sections. Build up the structure to desired elevation and dimensions. The backfill section shall be capped with a course of crushed rock to create a level bedding for the riparian sod mats.

3.3 Placement of Riparian Sod Mats

Wetland sod mats shall be placed in accordance with **Section 401 Riparian Sodmat Plantings** and the construction drawings.

PART 4 - MEASUREMENT AND PAYMENT

[301.1] Streambank Soil Bioengineering: Supply & Construct Toe Protection shall be measured and paid on a linear foot basis, measured along the streambank, for a complete structural section (LF) as determined from the plans and by the Landowner or authorized representative. Such payment will constitute full compensation for all labor, equipment, tools, and all other items necessary and incidental to the work.

Compensation for any item of work described in the contract, but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in the plans and these specifications.

***** END OF SECTION ****

SECTION 302 – BOULDER STRUCTURES

PART 1 - GENERAL

1.1 Description

The work shall include the supply and transport of all labor, material, and equipment to successfully construct boulders in the stream corridor, as shown on the plans and to the requirements of this construction specification.

1.2 Scope of Work

The work shall consist of furnishing and installing boulder structures, as shown on the drawings.

PART 2 - MATERIALS

2.1 Boulders

Boulders shall be obtained from an onsite stockpile, as approved by the Landowner. Individual boulders shall be dense, sound, and free from cracks, seams, and other defects conducive to accelerated weathering. Except as otherwise specified, the boulders shall be angular to sub-rounded.

PART 3 - EXECUTION

3.1 Boulder Structure Placement

Boulders shall be keyed-in, placed, and oriented such that finished rock surfaces conform to the lines and grades as specified on the plans. Boulders shall be placed on a compacted soil or crushed rock bedding, as shown on the plans, to the depth specified to provide maximum stability, foundation competence, and geometry as shown on the construction plans. The rock should be placed with the proper equipment to ensure that the rocks are interlocked and stable.

Fill all gaps and voids of the boulder structures with crushed rock to minimize piping of water through the structures. Smaller rocks and spalls shall fill the voids between the larger rocks. Some hand placing may be required to provide a neat and uniform surface.

PART 4 - MEASUREMENT AND PAYMENT

[302.1] Boulders: Transport & Install shall be measured and paid on (LS)) basis for transporting and placing boulders stockpiled on site. Excavation and filling operations are considered incidental to the work for this item. Disposal of spoils from these operations (if required) are considered incidental to the work for this item. Such payment will constitute full compensation for all labor, equipment, tools, transportation, materials, and all other items necessary and incidental to the work.

***** END OF SECTION *****

SECTION 303 – RIVER TRAIL

PART 1 - GENERAL

1.1 Description

This work shall include the supply of all labor, materials, and equipment required to complete trail construction as shown on the plans and to the requirements of this construction specification.

1.2 Scope of Work

Construct new sections of river trails and decommission abandoned sections of trails.

1.3 Inspection

The Contractor shall stop work and call for inspection at the following points of construction:

- B. Upon discovery of any archaeological artifacts

1.1 References

- A. City of Flagstaff Engineering Detail Flagstaff Urban Trail System No. 14-01-010
- B. US National Forest Service Standard Trails Plans and Specifications
- C. American Trails Resource Library
- D. MAG Uniform Standard Specifications and Details for Public Works Construction, 2014
- E. Trail Surface Aggregate, Penn State University Technical Bulletin 2013

PART 2 - MATERIALS

2.1 Native Soil

Native fill is composed of natural earth materials that can be placed and compacted by construction equipment, hand tamping, manually directed power tampers or vibrating plates, or their equivalent operated in a conventional manner. On site soils consist of alluvial deposits and loam. All fill material shall be collected from excavation and shaping activities. The selection, blending, routing, and disposition of material in the various fills shall be subject to approval by the Engineer.

2.2 Weed Barrier

Weed Barrier/geotextile fabric shall be Class III non-woven with minimum grab tensile strength of 90 pounds, greater than 50% elongation at failure, a minimum of 40-pound puncture strength, and UV resistance of 70% strength retained.

2.3 Trail Base Course

The base course for the trail shall be a well graded aggregate mixture of crushed rock and fines and shall conform to the requirements of MAG Section 702, except the gradation shall be as follows:

| Standard Sieve Size | Percent Passing by Weight: |
|---------------------|----------------------------|
| 2 inches | 100 |
| 3/4 inch | 52-100 |
| 3/8 inch | 36-70 |
| No. 4 | 24-50 |
| No. 8 | 16-38 |
| No. 16 | 10-30 |
| No. 200 | 0-10 |

2.4 Trail Surface Course

The surface course for the trail shall be a mixture of crushed rock and fines and shall conform to the requirements of MAG Section 702, except the gradation shall be as follows:

| Standard Sieve Size | Percent Passing by Weight: |
|---------------------|----------------------------|
| 1 inch | 100 |
| 3/4 inch | 96-100 |
| 1/2 inch | 85-99 |
| 3/8 inch | 79-98 |
| No. 4 | 68-87 |
| No. 8 | 52-74 |
| No. 30 | 27-50 |
| No. 100 | 16-30 |
| No. 200 | 13-27 |

The rock must be crushed into irregular and angular particles to allow interlocking into a firm matrix and have adequate fines and natural binders to cement the particles together after the course is moistened, compacted, and allowed to dry. Volcanic cinders, decomposed granite, pea gravel, or river rock are not acceptable materials.

PART 3 - EXECUTION

3.1 General Site Preparation

Prior to any river trail construction activities commencing, the site shall be prepared as follows:

- A. SWPPP BMP's shall be placed in accordance with **Section 103 General Requirements**.
- B. The designated "Brush/Tree Trimming Areas" shall be prepared in accordance with **Section 103 General Requirements and associated Environmental Compliance Documents**.
- C. Areas within the trail alignment designated as willow clump or riparian sod harvesting areas shall be prepared in accordance with **Section 401 Riparian Sodmat Plantings and Section 402 Willow Clump Plantings**.

3.2 Foundation Preparation

Foundations for the trail shall be cleared, grubbed, and stripped to remove vegetation and other unsuitable material. Except as otherwise specified, earth foundation surfaces shall be graded to remove surface irregularities, vegetation and other unsuitable material and provide a smooth and consistent trail grade, with slopes not exceeding 5% in any location. The foundation shall be scarified parallel to the axis of the fill or otherwise acceptably scored and loosened to a minimum depth of 6 inches. The moisture content of the loosened material shall be controlled as specified, and the surface material of the foundation shall be compacted and bonded with the first layer of trail base course, as specified for subsequent layers of earthfill.

3.3 Weed Barrier Placement

The trail base course shall be placed over a non-woven geotextile weed barrier fabric. The surface on which the geotextile is to be placed shall be graded to the neat lines and grades as shown on the drawings. The surface shall be reasonably smooth and free of loose rock and clods, holes, depressions, projections, muddy conditions and standing or flowing water. The geotextile shall be placed on the prepared surface at the locations and in accordance with the details shown on the drawings. The geotextile shall be unrolled along the placement area and loosely laid (not stretched) in such a manner that it will conform to the surface irregularities when material is placed on or against it. The geotextile may be folded or overlapped to permit proper placement in the designated area.

The geotextile shall be joined by overlapping a minimum of 18 inches (unless otherwise specified) and secured against the underlying foundation material. Securing pins, approved, and provided by the geotextile manufacturer, shall be placed along the edge of the panel, or roll material to adequately hold it in place during installation. Pins shall be steel, or fiberglass formed as a **U**, **L**, or **T** shape or contain "ears" to prevent

total penetration through the geotextile. Steel washers shall be provided on all but the **U**-shaped pins. The upstream or upslope geotextile shall overlap the abutting downslope geotextile. At vertical laps, securing pins shall be inserted through the bottom layers along a line through approximately the mid-point of the overlap. At horizontal laps and across slope laps, securing shall be inserted through the bottom layer only. Securing pins shall be placed along a line about 2 inches in from the edge of the placed geotextile at intervals not to exceed 12 feet unless otherwise specified. Additional pins shall be installed as necessary and where appropriate to prevent any undue slippage or movement of the geotextile. The use of securing pins will be held to the minimum necessary. Pins are to remain in place unless otherwise specified.

Should the geotextile be torn or punctured, or the overlaps or sewn joint disturbed, as evidenced by visible geotextile damage, subgrade pumping, intrusion, or grade distortion, the backfill around the damaged or displaced area shall be removed and restored to the original approved condition. The repair shall consist of a patch of the same type of geotextile being used and overlaying the existing geotextile. When the geotextile seams are required to be sewn, the overlay patch shall extend a minimum of 1 foot beyond the edge of any damaged area and joined by sewing as required for the original geotextile except that the sewing shall be a minimum of 6 inches from the edge of the damaged geotextile. Geotextile panels joined by overlap shall have the patch extend a minimum of 2 feet from the edge of any damaged area.

3.4 Trail Base and Surface Course Placement & Compaction

The base course and surface course for the trail shall be placed and compacted in accordance with MAG Section 310. Compaction for both courses shall be 95%.

3.5 Finish Grading

All finished surfaces shall meet the lines and grades shown in the drawings, including slopes/crowns, and be generally smooth and blend into surrounding terrain. All areas disturbed by the Contractor during construction operations shall be bladed smooth, shaped, and compacted. The construction, maintenance, and removal of all haul roads from the borrow areas shall be the responsibility of the Contractor and be considered incidental to the work.

Should fill settlement occur during construction and within seven days of substantial completion, and prior to acceptance of the work, additional material shall be placed and trimmed to achieve final grade by the Contractor at his or her own expense.

3.6 Trail Decommissioning

Existing trail beds designated for decommissioning shall be scarified or otherwise acceptably scored and loosened to a minimum depth of 6 inches. Weed fabric exposed as part of scarification shall be collected and disposed of properly. Slash consisting of previously cleared brush, logs, limbs, or other suitable material, if available, shall be spread randomly across the trail bed, approximately perpendicular to the trail surface. Tamp slash into the ground so that 80% of slash is in contact with the ground.

3.7 Disposal of Unsuitable or Surplus/Overburden Materials

Cleared, grubbed, and stripped material shall be disposed of in designated areas, as directed by Landowner. All haul roads, access roads and temporary crossings are to be removed.

PART 4 - MEASUREMENT AND PAYMENT

[303.1] River Trail: Supply & Construct shall be measured and paid on linear foot (LF) basis as determined from the plans. This quantity includes earthfill required for replacement of cleared, grubbed, and stripped material. Hauling, dumping, & compacting base and surface courses, smoothing, and grading courses, and disposing of waste material shall be incidental to trail construction operations. No adjustment in quantities will be made for waste material from finish grading, shrinkage of excavated material resulting from compaction operations, or wasting surplus. Required site preparation activities shall be considered incidental to excavation operations and no separate payment will be made. Building, maintaining, and removal of temporary roads and haul routes shall be considered incidental to those operations and no separate payment will be made. Excavation of keyways for placement of rock courses, as required, and subsequent placement in designated disposal areas shall be considered incidental to the cost of those elements, and no separate measurement or payment will be made.

[303.1] River Trail: Decommission shall be measured and paid on linear foot (LF) basis as determined from the plans. Disposing of waste materials, as required, shall be incidental to trail decommissioning operations.

***** END OF SECTION *****

SECTION 304 – CULVERT PIPE

PART 1 - GENERAL

1.1 *Description*

The work of this section shall include the supply of all labor, materials, and equipment required to complete the installation of the culverts as called for on the drawings and/or specified herein.

1.2 *Scope of Work*

- A. Salvage and re-installation of culvert pipe and appurtenances

1.3 *Inspection*

The contractor shall stop work and request inspection prior to placement of pipe to allow inspection of the excavation and initial backfill.

1.4 *Quality Control*

All workmanship and materials furnished and supplied under this specification are subject to close and systematic inspection and testing by the Landowner including all operations from the selection and production of materials through to final acceptance of the specified work. The Contractor shall be wholly responsible for the control of all operations incidental thereto notwithstanding any inspection or approval that may have been previously given. The Landowner reserves the right to reject any materials or works, which are not in accordance with the requirements of this specification.

The Landowner shall be afforded full access for the inspection and control testing of materials, both at the site of work and at any plant or borrow pit used for the supply of the materials, to determine whether the materials are being supplied in accordance with this specification.

PART 2 - MATERIALS

2.1 *Culvert Pipe*

Culvert pipe shall be carefully salvaged onsite and relocated, as noted in the drawings. The Contractor shall coordinate relocation activities on nearby and more distant areas of the site as directed by the Landowner.

PART 3 - EXECUTION

3.1 *Handling and Storage of Materials*

The Landowner shall be notified of damage or unsuitable material prior to handling for installation.

3.2 *Trench Excavation*

Trench excavation shall extend 2 feet beyond the ends and 1 foot beyond the sides of the pipe. The base of the trench shall be excavated to a depth such that the installed pipe meets pipe invert elevations as shown on the plans. The resulting bed shall be fully leveled and compacted by suitable compaction equipment to a minimum of 95% of maximum density as determined by the Standard Proctor Method ASTM D698 throughout the full width and length of the trench, such that the pipe is fully supported for their entire length/width.

3.3 *Assembly of Pipe*

The Contractor, after preparation of the trench and pipe bed, shall assemble the pipe (if required) and placed in the trench. All pipes shall be inspected prior to assembly for chipping or damage in handling. If materials are damaged, distorted by more than 5 percent of nominal dimensions, broken, or deemed unsuitable, the Landowner will coordinate with the Contractor to locate other culvert materials for placement.

3.4 *Haunch Culvert Backfill*

The area of the pipe between the springline and the bottom of the pipe is considered the haunch area. The most important factor in assuring proper pipe-soil interaction is the haunching material and its density. This material provides most of the support that the pipe requires to function properly regarding performance and

deflection. This material should be placed and worked carefully under the haunches of the pipe and between pipe corrugations (if required), to provide continuous support throughout the entire pipe length. In doing so, proper control should be exercised to avoid vertical and horizontal displacement of the pipe from proper alignment. For the haunching to provide adequate support, it must be consolidated at regular intervals to the springline of the pipe. The haunching backfill material shall be placed in layers that have a maximum thickness of about 6-inches and compacted by suitable compaction equipment to a minimum of 95% of maximum density as determined by the Standard Proctor Method ASTM D698. During compaction operations, care shall be taken to ensure that the tamping or vibratory equipment does not come in contact with the pipe and the pipe is not deformed or displaced. Because the native soil material is fined grain sand with silts, moisture content must be near optimum to minimize compactive effort and achieve the required density. If necessary, the excavation shall be dewatered in order to prevent disturbing the natural soil conditions at the base of the excavation and to allow the placing and compacting of the backfill material in the dry.

3.5 Initial Culvert Backfill

This portion of the pipe embedment begins at the springline of the pipe and extends to 1-foot above the top of the pipe. The initial backfill material shall be placed in layers that have a maximum thickness of about 6 inches and compacted by suitable compaction equipment to a minimum of 95% of maximum density as determined by the Standard Proctor Method ASTM D698. During compaction operations, care shall be taken to ensure that the tamping or vibratory equipment does not come in contact with the pipe and the pipe is not deformed or displaced.

3.6 Final Culvert Backfill

After initial backfilling has been completed, the remaining backfill shall be executed to the lines and grades shown on the plans and as specified herein. The final backfill material shall be placed in layers that have a maximum thickness of about 6 inches and compacted by suitable compaction equipment to a minimum of 95% of maximum density as determined by the Standard Proctor Method ASTM D698.

3.7 Control of Surface & Subsurface Water

To achieve proper moisture content and compaction for foundations and backfill, surface and subsurface water will need to be controlled per **Section 103I**.

PART 4 - MEASUREMENT AND PAYMENT

[304.1] Culvert: Salvage, Transport, & Place shall be measured and paid on an individual (EA) basis as determined from the plans. Such payment will constitute full compensation for all labor, equipment, tools, and all other items necessary and incidental to the work, including, but not limited to culvert pipe and appurtenances, as well as trenching/excavation, and backfill placement. No adjustment in quantities will be made for over-excavation. Dewatering or the control and drainage of surface/sub-surface shall be considered incidental to water control structure installation operations and no separate payment will be made.

***** END OF SECTION ****

SECTION 305 – WOODY DEBRIS

PART 1 - GENERAL

1.1 Description

The work shall include the supply and transport of all labor, material, and equipment to successfully complete the placement woody debris throughout the site.

1.2 Scope of Work

- A. Place woody debris throughout the site

PART 2 - MATERIALS

2.1 Woody Debris

Woody debris shall come from a large log and slash pile located on site. After materials have been sorted, all woody debris that are not suitable for placement as Streambank Soil Bioengineering Toe Protection shall be placed throughout the floodplain to provide additional habitat at newly excavated swale, depression, and backwater areas. Woody debris can be logs, trees, slash, stumps, root wads or other plant material.

PART 3 - EXECUTION

3.1 Woody Debris Placement

The woody debris shall be placed in the approximate locations and spacings shown in the plans. Natural variation in the materials is expected, as well as expected quantities of materials, and the Contractor shall work closely with the Landowner on final placements, if required. To anchor the debris, they should be partially embedded. If backfilling around the haunches of the log is required for embedment, the soil shall be placed in 4-inch or less horizontal layers and hand compacted.

PART 4 - MEASUREMENT AND PAYMENT

[305.1] Woody Debris: Sort, Transport, & Place shall be measured and paid on lump sum basis (LS) as determined from the plans and by the Landowner or authorized representative. Such payment will constitute full compensation for all labor, equipment, tools, and all other items necessary and incidental to the work, including, but not limited to, excavation of keyways.

***** END OF SECTION *****

DIVISION 400 NATIVE PLANTINGS

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SECTION 401 – RIPARIAN SODMAT PLANTINGS

PART 2 - GENERAL

2.1 Description

The work shall include the supply and transport of all labor, material, and equipment required for furnishing and placing sodmats as shown on the plans and to the requirements of this construction specification.

2.2 Scope of Work

F. Salvage/Harvest and Transplant Sodmats

2.3 References

G. NRCS Plant Materials Technical Note No. 22, Wetland Sodmats, 2008

PART 3 - MATERIALS

3.1 Riparian Sodmats

Sodmats are large pieces of intact wetland and riparian soil and vegetation. Sodmats shall be from native species adapted to the region, located within the areas designated for “Floodplain Swale”, “Floodplain Depression”, and “Backwater Channel” excavation, as well as “River Trail” construction. Any native sod present in harvesting locations designated by the Arizona Game and Fish Department or its agent(s) shall be acceptable material for transplant, unless noxious weeds are present.

PART 4 - EXECUTION

4.1 Sodmat Harvesting

Sodmats shall be salvaged/harvested from designated areas prior to commencing excavation and shaping activities and trail construction. Sodmats can be harvested with shovels, backhoe, or a front-end loader modified with a sharp-edged steel plate that undercuts the sod for removal. Sodmats can be up to 8-foot square depending on the equipment used for harvesting. Generally, sodmats should be 6 to 8-inches thick. Thicker mats may be harder to handle and transport.

4.2 Storage and Handling

Sodmats stored for two or three days can be stacked on top of each other if there is not room to lay them out individually. Sodmats stored for longer than three days shall be kept wet, with an impenetrable layer between the mat and the ground to prevent roots taking hold into the ground.

4.3 Planting

The harvested sod should be placed back into the disturbed area created from the excavation and shaping of the “Floodplain Swales”, “Floodplain Depressions”, and “Backwater Channel”. Sodmats shall also be placed on streambank floodplain benches designated for “Streambank Soil Bioengineering” as shown in the drawings. Sod mats shall be placed to conform to the new contours of the channel and streambank, as shown in the plans, and should fit tightly together to prevent large gaps between adjacent mats.

PART 5 - MEASUREMENT AND PAYMENT

[401.1] Riparian Sodmat: Salvage/Harvest & Transplant

This item shall be measured and paid on a per acre basis (AC) of sodmat planted as determined from the plans and by the Landowner or authorized representative. Such payment will constitute full compensation for all labor, equipment, tools, and all other items necessary and incidental to the work including harvesting, storing, handling, and placing sodmats.

***** END OF SECTION *****

SECTION 402 – WILLOW CLUMP PLANTINGS

PART 1 - GENERAL

1.1 Description

The work shall include the supply and transport of all labor, material, and equipment required for furnishing and placing willow clumps as shown on the plans and to the requirements of this construction specification.

1.2 Scope of Work

H. Salvage/Harvest and Transplant Willow Clumps

1.3 References

I. NRCS Plant Materials Technical Note No. 42, Willow Clump Plantings, 2010

PART 2 - MATERIALS

2.1 Willow Clumps

Willow Clumps shall be from native species adapted to the region, located within the area designated for “River Trail” construction as shown in the drawings. Any native willows present in harvesting locations designated by the Arizona Game and Fish Department or its agent(s) shall be acceptable material for transplant, unless noxious weeds are present.

PART 3 - EXECUTION

3.1 Willow Clump Harvesting

Locate willow clumps that are young and vigorous, and about the diameter of the backhoe/excavator bucket. Dig straight down and under to the willow clump root mass. Start the hole about 10 inches away from the stems and dig down about the depth of the bucket (approximately 2 feet). Try to get as much of the root mass as possible.

3.2 Storage and Handling

Do not allow clumps to dry out significantly. If it is sunny and hot, consider temporarily tarping the clumps to reduce sun exposure and potential drying during transport or storage. Water the willow clumps when they arrived at the planting site if it will some time before clumps can be planted. Avoid leaving the clumps in the sun for long periods.

3.3 Planting

The harvested willow clumps should be placed back into the disturbed area created from the excavation and shaping of the “Streambank Soil Bioengineering” and adjacent planting areas as shown on the plans. Clumps shall be placed to conform to the new contours of the floodplain at the spacing shown in the plans. Soil conditions will vary from site to site. In some situations, you will be able to plant the clumps without pre-digging the planting hole by pushing the soil out of the hole with the bottom of the backhoe bucket and then dropping the clump into this hole. Under more difficult soil conditions or where the water table is deep, you will need to pre-dig the holes to put the willow clumps in. Dig the holes deep enough so you are just above the standing water table. Do not dig into the water table. Ideally you want the root mass of the clump to be in the saturated moisture zone and not in the standing water zone. Dig a hole that is about the diameter of the clump. Place clumps with a thumb on the backhoe or with the front-end bucket and drop them in the holes. Fill in the hole with soil and water. Mud-in the willow clumps so there are no air pockets around the roots.

PART 4 - MEASUREMENT AND PAYMENT

[402.1] Willow Clump: Salvage/Harvest & Transplant

This item shall be measured and paid on a per clump basis (CLUMP) as determined from the plans and by the Landowner or authorized representative. Such payment will constitute full compensation for all labor, equipment, tools, and all other items necessary and incidental to the work including harvesting, storing, handling, and placing willow clumps.

*** END OF SECTION ***

SECTION 403 – NATIVE SEEDING

PART 1 - GENERAL

1.1 Description

The work shall include the supply and transport of all labor, material, and equipment required for furnishing and placing seed as shown on the plans and to the requirements of this construction specification.

1.2 Scope of Work

- A. Soil mitigation and seed bed preparation
- B. Supply and broadcast seed mix
- C. Apply mulch.

PART 2 - MATERIALS

2.1 Seed

The seed mixtures in the following tables shall be used and applied as designated on the plans. Any substitutions will be approved by the AZG&F Department or its agent(s). Seed shall be labeled in accordance with the state laws and the U.S. Department of Agriculture rules and regulations under the Federal Seed Act in effect on the date of invitations for bids. All seed shall be delivered in sealed bags or containers clearly labeled to show the name and address of the supplier, the seed name, the percent of weed seed content, the guaranteed percentage of purity and germination, pounds of pure live seed (PLS) of each seed species, and total pounds of PLS in the container. All seed shall be certified as free from noxious weeds. The AZG&F Department or its agent(s) shall be supplied with all seed tags for approval prior to application.

Seed which has become hot, wet, moldy, or damaged in transit or in storage will not be accepted. Seed shall be stored in a cool, dry location that is secure from pests until the day of application. Seed to be applied on a particular day shall be stored in the shade. Seed mix species, composition and rates are shown in the tables below:

Due to the relatively low seeding rates, it may be necessary to use a seed extender such as rice hulls, natural corn cobs, or medium-grade vermiculite to meet PLS lbs/acre rates described in the tables below.

| POLLINATOR MIX (4lbs/acre) | | | |
|--|---------------------------|------------|------------------|
| Species | Common Name | Type | % of Seed Mix/Lb |
| <i>Achilla millefolium</i> | Common yarrow | Herbaceous | 5% |
| <i>Asclepias asperula</i> | Spider Milkweed | Herbaceous | 3% |
| <i>Asclepias latifolia</i> | broadleaf milkweed | Herbaceous | 3% |
| <i>Asclepias subverticillata</i> | horsetail milkweed | Herbaceous | 3% |
| <i>Asclepias eriocarpa</i>) | Woollypod Milkweed | Herbaceous | 3% |
| <i>Asclepias engelmanniana</i> | Englemans milkweed | Herbaceous | 3% |
| <i>Asclepias speciosa</i> | showy milkweed | Herbaceous | 3% |
| <i>Asclepias tuberosa spp. interior)</i> | Butterflyweed | Herbaceous | 3% |
| <i>Castilleja minata</i> | scarlet indian paintbrush | Herbaceous | 3% |
| <i>Cleome serrulata</i> | Rocky Mountain beeplant | Herbaceous | 3% |
| <i>Dalea candida</i> | white prairie clover | Herbaceous | 3% |
| <i>Erigeron divergens</i> | spreading fleabane | Herbaceous | 3% |
| <i>Eriogonum wrightii</i> | Wrights buckwheat | Herbaceous | 3% |
| <i>Helianthus annuus</i> | Common sunflower | Herbaceous | 3% |
| <i>Iris missouriensis</i> | Rocky Mountain iris | Herbaceous | 3% |
| <i>Linium lewisii</i> | wildblue flax | Herbaceous | 3% |

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| | | | |
|--------------------------------|--------------------------|------------|----|
| <i>Lupinus brevicaulis</i> | shortstem lupine | Herbaceous | 3% |
| <i>Lupinus argenteus</i> | silvery lupine | Herbaceous | 3% |
| <i>Lupinus arizonicus</i> | Arizona lupine | Herbaceous | 3% |
| <i>Lupinus palmeri</i> | bluebonnet Lupine | Herbaceous | 5% |
| <i>Monardra fistulosa</i> | wild bergamont | Herbaceous | 3% |
| <i>Oenothera caespitosa</i> | tufted evening primrose | Herbaceous | 3% |
| <i>Oenothera flava</i> | yellow Evening Primrose | Herbaceous | 3% |
| <i>Penstemon eatonii</i> | firecracker penstemon | Herbaceous | 3% |
| <i>penstemon palmeri</i> | Palmer's penstemon | Herbaceous | 3% |
| <i>Penstemon strictus</i> | Rocky Mountain Penstemon | Herbaceous | 3% |
| <i>Ratibida columnifera</i> | Prairie coneflower | Herbaceous | 3% |
| <i>Solidago wrightii</i> | wrights goldenrod | Herbaceous | 3% |
| <i>Sphaeralcea spp</i> | Globe mallow | Herbaceous | 3% |
| <i>Symphotrichum ascendens</i> | Western aster | Herbaceous | 3% |
| <i>Symphotrichum foliacium</i> | leafy aster | Herbaceous | 3% |

2.2 Weed Free Straw Mulch

Straw mulch shall consist of wheat, barley, oat or rye straw, hay, grass cut from native grasses, or other plants as specified on the plans. The mulch material shall be air-dried, reasonably light in color, and shall not be musty, moldy, caked, or otherwise of low quality. The use of mulch that contains noxious weeds is not permitted. All areas receiving mulch treatments will be treated with an M-binder organic tackifying agent. Product substitutions shall be approved by the AZG&F Department or its agent(s). M-binder shall meet the following technical specifications:

M-binder Technical Specifications

| | |
|-------------------|------|
| Protein contents | 1.62 |
| Ash content | 2.70 |
| Fiber | 4.00 |
| pH of 1% solution | 6.80 |
| Settleable solids | 5.00 |

2.3 Flexible Growth Medium for Hydroseeding

The Flexible Growth Medium shall be Flexterra HP-FGM or a similar product meeting the standards in the table below. Product substitutions shall be approved by the AZG&F Department or its agent(s).

PART 3 - EXECUTION

3.1 Soil Mitigation

After final grade is attained to the approval of the AZG&F Department or its agent, calibration of application rates shall be approved by the AZG&F Department or its agent(s) prior to application. Soil will be tilled to a 6-inch depth. Two tilling passes shall occur, with the final pass occurring on the contour. The AZG&F Department or its agent(s) will inspect and approve the final tilling on-contour slope. An additional tilling pass may be required to meet furrow slope requirements and to completely incorporate the amendments to the desired treatment depth of 6 inches. The Contractor shall remove debris such as tree branches, and large roots that will interfere with normal ripping and seeding operations.

3.2 Seedbed Preparation

Final grade all disturbed areas with a rough surface to facilitate seed entrapment, moisture retention and erosion control with approved equipment. A rough seed bed is the goal with the tilling furrows approximately 6-inches deep. In areas where equipment cannot be operated, the seedbed shall be prepared by hand. Seeding shall be conducted immediately after ripping of the amendments and final seed bed preparation to prevent the formation of a soil crust that may develop after a precipitation event. The AZG&F Department or its agent(s) will inspect and approve the seed bed immediately prior to seeding activities. Seed bed preparation shall be completed only on those acreages that can be reasonably seeded the following day. Note: wetland and riparian planting areas will not be ripped to 6-inches, rather these areas shall be hand raked or mechanically raked using an ATV pulling a mattress spring (or similar) to provide soil surface texture. Seeding shall occur prior to planting plugs or live plant materials.

3.3 Seeding Procedure

All seeding operations shall be performed in such a manner that the seed is applied in the specified quantities uniformly in the designated areas at an application rates described in section 1.2 above. Seed bed shall be adequately prepared as described in section 1.2 above. Seed shall be incorporated into the soil, but not more than 1-inch deep. The time for seeding shall be from September 15th to October 15th, or other dates as approved by the AZG&F Department or its agent(s). Seeding will primarily be accomplished with a broadcast seeder on a tractor, ATV or by hand. Seed shall be broadcast on all areas where the slope is not steeper than 2.5:1. Steeper slopes shall be hydroseeded or hand-broadcast seeded. Selection of appropriate seed application measures will depend on site-specific conditions and will be determined in consultation with the AZG&F Department or its agent(s). Seeding methods and calibration of application rates shall be approved by the AZG&F Department or its agent(s) prior to application.

3.4 Hydroseeding Application

If hydroseeding is necessary, on slopes over 2.4:1, it shall be applied by experienced personnel and will meet the following requirements:

- Hydraulic equipment used for application shall have built-in agitators that will keep seed and water mixed homogeneously until pumped from the tank. Pump pressure shall be such as to maintain a continuous, non-fluctuating stream of the slurry.
- Seed shall be added after the tank is full of water and allowed to mix for at least 5 minutes prior to starting application. The seed shall not remain in the tank for more than 45 minutes. If 45 minutes is exceeded, the Contractor, at his own expense, shall add additional seed equal to the original amount specified.
- A Flexible Growth Medium (FGM) will be applied to the hydroseeding mix as specified below. The FGM shall meet the standards in the table below or be approved by the AZG&F Department or its agent(s).
- Calibration of application rates shall be approved by the AZG&F Department or its agent(s) prior to application.

The Flexible Growth Medium (FGM) described will be applied to the hydroseeding mixture as described below. FGM will be applied at a rate of 3,500 lbs./acre for slopes ranging from 3:1 to 2:1. FGM will be applied at a rate of 4,000 lbs./acre for slopes ranging from 2:1 to 1:1. Slopes greater than 1:1 will receive FGM at a rate of 4,500 lbs./acre. Application and loading procedures are specified below for Flexterra HP-FGM.

- Strictly comply with equipment manufacturer's installation instructions and recommendations. Use approved hydro-spraying machines with fan-type nozzle (50-degree tip) whenever possible to achieve best soil coverage. Apply from opposing directions to assure 100% soil surface coverage.

Slope interruption devices may be needed for slopes over 3:1. Consult the manufacturer's recommendations.

- To ensure proper application rates, measure, and stake area.
- Apply in a two-step process.
 - First, apply 50% of seed with a small amount of HP-FGM™ or ET-FGM™ for visual metering.
 - Mix balance of seed and apply FGM at a rate of 50 pounds per 125 gallons. Consult manufacturer's loading rates.
- Fill 1/3 of mechanically agitated hydroseeder with water. Turn pump on for 15 seconds and purge and pre-wet lines. Turn pump off.
- Turn agitator on and load low-density materials first (i.e., seed).
- Continue slowly filling tank with water while loading fiber matrix into tank.
- FGM should be completely loaded before water level reaches 75% of the top of tank.
- Top off with water and mix until all fiber is fully broken apart and hydrated (minimum of 10 minutes— increase mixing time when applying in cold conditions).
- Shut off recirculation valve to minimize potential for air entrainment within the slurry.
- Slow down agitator and start applying with a 50-degree fan tip nozzle.
- Spray in opposing directions for maximum soil coverage

3.5 Mulch Application

Mulch shall be applied to reach 40% coverage, achieving a mulch layer that is approximately 1/4 –inch thick. Slopes above 2.5:1 will receive M-binder at a rate of 200 lbs./acre slopes below 2.5:1 will receive M-binder at a rate of 150 lbs./acre. M-binder can be applied as a dry powder or as a wet slurry. All product application recommendations will be met. Hydroseeded areas should have Flexible Growth Medium (FGM).

PART 4 - MEASUREMENT AND PAYMENT

[403.1] Native Seed: Supply, Broadcast, & Mulch

This item shall be measured and paid on a per acre basis (AC) as determined from the plans. Such payment will constitute full compensation for all labor, equipment, tools, and all other items necessary and incidental to the work, including, but not limited to, site preparation, broadcasting of seed, fertilizer, and mulch, and mulch anchoring activities. No payment will be made for areas seeded with unapproved seed. No adjustment in payment will be made for the number of seeding mobilization activities.

***** END OF SECTION *****

BECKER LAKE WILDLIFE AREA OPERATIONAL MANAGEMENT PLAN

(This is a living document that addresses the operation of the property, together with the corresponding budget. This document will be updated to reflect changes in operational management overtime.)



Arizona Game and Fish Department
5000 West Carefree Highway
Phoenix, Arizona 85086

May 1, 2012

I. Introduction – Executive Summary

A. The purpose of this operational plan is to provide management direction and budget needs for the operation and maintenance of the Becker Lake Wildlife Area (BLWA).

B. The purpose of the BLWA is to provide quality habitat for the federally threatened Little Colorado spinedace within the Little Colorado River, manage for a quality trout fishery in Becker Lake, maintain and enhance aquatic and riparian habitat and provide compatible wildlife related recreational opportunities.

C. The BLWA was purchased in two transactions. Becker Lake and the immediate surrounding lands totaling 338 acres were purchased in 1973 to provide a trout fishery. In 2001 a second purchase of an additional 296 acres were added to the BLWA boundary. This second parcel is designated primarily for the management of sensitive species and their habitats.

D. During the life of this operational plan it is recommended to manage BLWA to encompass several focus fronts which are sensitive species and associated habitat management, maintain and enhance the Becker Lake trout fishery and provide a quality visitor experience.

II. PROPERTY PURPOSE and MANAGEMENT GOALS AND OBJECTIVES

A. **PURPOSE:** The BLWA was acquired for several purposes. The original 1973 purchase of the lake and surrounding lands was to manage for a quality trout fishery and waterfowl area. The subsequent 2001 purchase of lands along the Little Colorado River (LCR) was to conserve and enhance sensitive stream-riparian habitat values associated with the property for the conservation of federally-listed native fish and other wildlife of greatest conservation need.

B. **FUNDING SOURCES:** The original parcel was purchased primarily with Federal Aid in the Restoration of Wildlife Funds and the second parcel was purchased primarily with Heritage Acquisition Funds.

C. **MANAGEMENT GOALS AND OBJECTIVES:** The goals of the Department's management effort at BLWA is to conserve and enhance aquatic and riparian habitat values for the management of federally-listed Little Colorado spinedace and Southwestern willow flycatcher, and provide the public with a quality recreational experience that includes fishing for trout and observing wildlife. Management objectives include the maintenance and enhancement of aquatic habitat within the LCR corridor through active and passive management actions, maintaining and expanding desirable woody vegetation along the LCR and other suitable areas, maintaining quality foraging and other habitats for game and non-game species, providing a quality trout fishery and promoting compatible public recreational activities.

III. PROPERTY DESCRIPTION

A. **Property Location:** The BLWA consists of approximately 634 acres of Arizona Game and Fish Commission deeded lands located within the town limits of Springerville in Apache County.

B. **Biological**

1. **Habitat:** BLWA is composed of a variety of habitats including approximately $\frac{3}{4}$ mile of LCR stream-side habitat, 120 acres of wet meadow, five plus acres of stream riparian habitat, narrow leaf cotton wood trees located roughly along the Becker Lake filler ditch and south of the lake, an 85 acre lake, and a plains grassland community on the uplands.

2. **Species:** Native fish species documented on the BLWA include Little Colorado spinedace, Little Colorado sucker, bluehead sucker and speckled dace. Non-native fish include rainbow trout, brown trout, fat head minnows and green sunfish. Mammals documented on BLWA include: mule deer, pronghorn, Gunnison's prairie dog, beaver, badger and raccoon. Numerous bird species utilize the lake, riparian and grassland habitats. Noteworthy documented or probable bird species include: bald eagle, Southwestern willow flycatcher, bobolink, mountain plover, peregrine falcon and ferruginous hawk. Reptiles and amphibians include gophersnake, green prairie rattlesnake, terrestrial gartersnake, short-horned lizard and Western chorus frog.

IV. PROPERTY MANAGEMENT HISTORY

BLWA has been and continues to be managed for a variety of management goals and objectives. Since the Department has acquired these lands numerous improvements have been added to increase habitat values and the visitors' experience:

- At Becker Lake amenities include a boat ramp, parking lot, bathroom, and fishing dock.
- At Becker Lake two volunteer host camping pads were installed in 2011. The goal is for the hosts to inform the public about wildlife area regulations, and deter and detect violations.
- The 1993 purchase of the Wenima Wildlife Area lands located downstream of the BLWA and associated water rights included storage water rights at Becker Lake for 146 acre feet. This addition to the existing water rights totals 100% of the water rights associated with Becker Lake. Controlling all the water rights associated with Becker Lake simplifies the management of this quality trout fishery.
- Becker Lake has been managed as a blue ribbon fishery. Recent regulation changes restrict angling to fly or lure only with a catch and release program in place. The objective of retaining the trout in the lake is to provide a quality fishing experience providing anglers the ability to catch more and larger than average fish.
- A parking lot was built along Highway 60 near the LCR, and is associated with a

foot trail, informational kiosk, picnic table and benches, and informational signs located along the trail.

- A 75 foot long foot bridge was built over the LCR connecting the east and west sides of the wildlife area along the LCR. The foot trail runs from Airport road on the south up to the parking lot along Highway 60.
- Extensive streamside bank stabilization was conducted along portions of the LCR with assistance from river restoration engineers Natural Channel Design to reduce bank erosion and re-establish native vegetation.
- Approximately ½ acre of wet meadow near the Becker Lake filler ditch was fenced to exclude deer and was planted with narrow leaf cottonwood trees with assistance from the Northern Arizona University Cottonwood Herbarium. This action is consistent with the objective to increase desirable woody vegetation.
- Musk thistle became a dominant plant within large areas of the wet meadow habitats after livestock were removed in 2001. Musk thistle control efforts included broadcast burning and repeated spraying. Control efforts continue, and this noxious plant is much reduced from prior levels.
- Water conservation modifications were adopted within certain irrigated fields with the installation of plastic piping and the purchase of a diesel pump.
- Water flow gages were installed on the LCR to monitor flows in river and Becker Lake filler ditch.

V. PROPERTY MANAGEMENT OBJECTIVES AND ACTIONS

A. Base Operation and Maintenance:

1. Habitat by type or category

a) **Streamside Habitat Objectives:** Maintain and improve all reaches of LCR on property

(1) Actions:

(a) Inspect stream banks where previous stabilization measures constructed. Repair damaged areas where possible.

(b) Maintain and enhance aquatic habitat for Little Colorado spinedace and other native fish.

b) **Riparian Habitat Objectives:** Enhance and maintain sensitive riparian habitat

(1) Actions:

(a) Maintain fenced riparian plot and trees inside plot.

(b) Maintain and enhance cottonwood tree communities on property including trees along Becker Lake filler ditch.

(c) Maintain and plant additional cottonwood trees along LCR.

(d) Remove younger age classes of exotic Siberian elm and Russian olive trees. Monitor extent of exotic common reed grass distribution. Initiate

control efforts if expansion continues at undesirable rate.

(e) Promote and maintain native sedge and aquatic graminoid vegetation.

(f) Promote expansion of willow community for benefit of Southwestern willow flycatcher and other wildlife. Where possible utilize irrigation water system to expand and retain willow communities in wet meadows.

c) Wet Meadow and Irrigated Pasture:

(1) Actions:

(a) Maintain priority irrigated pastures to achieve various objectives and convert others into native vegetation communities.

(b) Plant desired crops and irrigate pastures when adequate water is available.

(c) Where feasible expand willow communities utilizing irrigation system to provide needed soil moisture.

(d) Annually control noxious vegetation including musk thistle with approved chemicals, burning, and mechanical and hand removal.

d) Becker Lake:

(1) Actions:

(a) Utilize fill ditch during permitted fill season of September 16 through April 15.

(b) Withdraw water from lake to irrigate portions of Wenima Wildlife Area to retain water rights and irrigate fields at least once every five years. Coordinate with Fisheries personnel prior to withdrawing lake water.

(c) Maintain sufficient water levels and quality for the benefit of trout fishery.

e) All Habitats:

(1) Actions: Monitor long-term changes in habitats by setting up photo monitoring points, and annually taking photos.

2. Wildlife

a) Little Colorado Spinedace:

(1) Objectives: Retain and enhance a robust population of Little Colorado spinedace within and adjacent to the portion of LCR within BLWA.

(a) Actions:

(i) Retain sufficient flow in LCR to maintain species during low flow periods.

Do not withdraw water for irrigation purposes when flows are below a specific threshold during early summer spawning season.

(ii) Retain a diversity of stream habitats for the benefit of this species.

b) Mule Deer:

(1) Objectives: Manage for a healthy mule deer population while taking measures to reduce vehicle collisions along Highway 60.

(a) Actions:

(i) Maintain deer crossing signs along Highway 60.

(ii) Promote less palatable vegetation in irrigated pasture near highway.

(iii) Encourage deer use along western portions of wildlife area by providing high quality feed in those irrigated fields. Also provide high quality deer feed on nearby Wenima Wildlife Area to encourage more deer use away from highway.

c) Southwestern Willow Flycatcher

(1) Objectives: Encourage use including nesting on BLWA by this endangered species.

(a) Actions:

(i) Enhance willow and cottonwood community along LCR and other suitable areas to establish extensive stands. Encourage establishment of willow species favored as nesting habitat.

d) Gunnison's Prairie Dog

(1) Objectives: Manage for a robust Gunnison's prairie dog population within Plains Grasslands habitat.

(a) Actions:

(i) Dust active holes with approved insecticide or approved oral plague vaccine when bubonic plague epizootic is predicted.

(ii) Restrict hunter take near boat launch area and volunteer host camp sites for public safety concerns.

3. Public Recreation/Use

a) Objectives: Provide public access compatible and consistent with management of sensitive wildlife resource values.

(1) Actions:

- (a) Maintain all parking lots and foot trails for public use.
- (b) Maintain signs in good condition informing users of current regulations.
- (c) Permit other non-traditional public uses on BLWA that promote the wildlife area, but do not conflict with established wildlife and habitat management goals and objectives (i.e. Round Valley Chamber of Commerce Christmas Festival).

4. Public Access/Restrictions

- a) Objectives: Provide public access compatible and consistent with management of sensitive wildlife resource values.

(1) Actions:

- (a) Utilize regulations and signing to restrict public access in identified areas to daylight hours, and limit permitted hunting areas and weapon types.
- (b) Utilize volunteer host program to monitor use of Becker Lake, to deter and detect violations.

5. Facility/Infrastructure

- a) Objectives: Maintain all property improvements in good operational condition

(1) Actions:

- (a) Inspect fishing dock for wave damage, clean and maintain restroom and lake parking lot, and maintain host camping sites in good condition.
- (b) Inspect and maintain dam, all irrigation ditches, and head gates, etc.
- (c) Inspect and maintain all boundary fences and boundary markers and signs.
- (d) Maintain other parking lots, trailheads, footbridge and foot trails.

6. Cultural Resources: There are no known historic or prehistoric cultural resources known on the BLWA.

- a) Objectives: Identify and protect any cultural resources on property.

- b) Actions: When land disturbing actions are proposed, comply with all State Historical Preservation Organization laws.

7. Community and Partner Collaboration:

- a) Objectives: Provide good communication with Springerville and Eagar Town Councils, Chambers of Commerce, local fishing clubs and other interested parties to assist in directing future

management actions on BLWA.

b) Actions: Promote open communication with interested parties during operational plan revisions, scoping major improvement projects and promote compatible uses of property.

8. Water Rights:

a) Objectives: Retain a portion of surface water rights to achieve stated natural resource based goals and objectives. Sever and transfer excess water rights to Zuni Tribe as part of adjudication obligation.

b) Actions: Identify areas requiring irrigation and storage needs essential to fulfill property goals and objectives.

B. Essential Restoration: Includes actions necessary to provide a safe environment for all users public, AGFD and wildlife

1. Category: Infrastructure

a) Objective: Ensure all buildings and other improvements are safe for members of the public and AGFD employees.

(1) Action: Infrastructure should be inspected periodically by Loss Prevention Coordinator and Ranch Manager.

C. Enhancement/Development:

1. Category: Wildlife – Sensitive Species

a) Objective: Sensitive Species Restoration

(1) Action: Evaluate the potential to introduce meadow jumping mice (*Zapus hudsonius luteus*) within suitable habitat along LCR.

VI. PROPERTY DEVELOPMENT/ENHANCEMENT OPPORTUNITIES AND LIMITATIONS

A. Limiting Factors:

B. Revenue Opportunities:

1. Objective: Promote revenue generation.

a) Action: Promote quality trout fishery, which may increase fishing license revenues.

b) Action: Evaluate potential to charge non-consumptive users of BLWA a user fee.

C. Community Collaboration/Partnerships:

1. Objective: Collaborate with Towns of Springerville and Eagar to develop strategies to promote BLWA as a destination for visitors to the Round Valley area.

a) Action: Coordinate with Town personnel to explore development of appropriate marketing plan.

D. TES Management Opportunities:

1. Objective: Promote wildlife diversity and watchable wildlife opportunities.

a) Action: Manage for increase in Gunnison prairie dog distribution on BLWA through regulating take and managing for plague outbreaks.

E. **Risk Assessment:** Currently all of the infrastructure at BLWA is in good working order, and there are no abandoned buildings that may be attractants. It is recommended to regularly inspect the floating fishing dock, especially after the winter and large windstorms. This lake is susceptible to high winds and waves over three feet high are common in the spring time. These waves can cause damage to the dock resulting in an unsafe structure. Routine inspections and timely repairs/dock closures would reduce any potential incidents with the public.

APPENDIX 1. The following Table illustrates key management activities that should be implemented within the next six year period (2012-2017) to help meet and monitor the attainment of management goals and objectives for the Becker Lake Wildlife Area. Manhours are predicted by utilizing funded AGFD personnel. Estimated costs are additional direct costs associated with that activity and does not include funded employee labor costs.

I. Becker Lake Wildlife Area – Property Management Plan Summary and Budget Matrix (Annual Implementation)

| II. Project Job, Objective, and Activity Description | Project Leader | Man Hours | Estimated Cost | Project Type | Pro |
|--|-----------------------|------------------|-----------------------|---------------------|-------------------------|
| Administration - Provide planning, coordination, budgeting, and administrative support for the operation of the property. | RI, HB | 24 | \$0 | O&M | Pro |
| Administration – Funding- Develop funding proposal for financing development and enhancement projects. | RI, HB | 8 | \$0 | O&M | Pro enh |
| Administration – Funding - Provide funding for operation of equipment for O&M of property | RI, HB | NA | \$0 | O&M | Ins ma |
| Administration – Fees - Pay Annual Norviel Decree Water Assessment for Enders parcel | HB | 3 | \$40 | O&M | Ad |
| Administration – Fees- Pay voluntary payments in lieu of taxes for Enders parcel | R1, HB | 3 | \$606 | O&M | Ful Di |
| Habitat – Monitoring - Conduct annual photo point monitoring | RI | 8 | \$0 | O&M | An mo |
| Habitat – Maintain native vegetation – control noxious weeds | RI | 120 | \$1400 | O&M | Co salt ma |
| Maintenance – Infrastructure - Conduct frequent inspections of property boundary fences and signing | RI | 80 | \$400 | O&M | Ide pro |
| Maintenance – Infrastructure - Inspect and maintain property boundary markers and signs | RI, DB | 8 | \$100 | O&M | Ins bou |
| Habitat – Water Rights - Retain and enhance native vegetation, retain instream flow, and deliver surplus water rights to Lyman Lake - Develop water management plan | RI, HB,DB | 120 | \$0 | ENH | De inst Ad |
| III. | | | | | |
| Public Recreation – Outreach - Develop and implement a “watchable wildlife” viewing and education plan | RI, IB | 16 | \$500 | O&M | Hig opp |
| Habitat – Wildlife Needs - Cultivate, re-seed, fertilize, and mow property pastures | RI | 160 | \$3000 | O&M | Ma der |
| IV. Project Job, Objective, and Activity Description | Project Leader | Man Hours | Estimated Cost | Project Type | Pro |
| Public Recreation/Fisheries – Maintain Volunteer Lake Host Program | RI - Fisheries | 60 | \$700 | O&M | Ke hav pro sea |
| Habitat – Water Rights - Inspect and maintain property irrigation ditches, head gates, and other structures to ensure they are operable and convey water effectively when needed to supply Becker Lake, and irrigate property pastures to maintain water rights. | RI | 80 | \$800 | O&M | Ide pro |
| Habitat and Public Recreation – Fishery - Monitor and | RI | 80 | \$1500 | O&M | Ma |

| | | | | | |
|--|-----------------------|------------------|-----------------------|---------------------|-----------------|
| maintain Becker Lake fill ditch during filling season. | | | | | the |
| Wildlife – Sensitive Habitat and Species - Monitor instream flows in the LCR and irrigation ditch system to determine annual flows and quantity diverted and available for irrigation. | RI, HB, DEV | 10 | \$?? | O&M | Da wa Zur |
| V. Wildlife/Fisheries - Sensitive Species Management | RI | 16 | \$0 | O&M | Sur |
| Habitat – Water Rights - Consult with the Office of the Attorney General to identify and implement strategies to maintain water rights and ensure adequate flows within the LCR in order to maintain and/or enhance sensitive species habitat. | RI,HB | 8 | \$0 | O&M | Ma |
| Maintenance – Equipment - Maintain vehicles and farming equipment needed for property operation and maintenance | RI | 40 | \$1500 | O&M | Ins ope |
| TOTALS | | 906 Hours | \$10,546 | | |
| | | | | | |
| | | | | | |
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| | | | | | |
| VI. Project Job, Objective, and Activity Description | Project Leader | Man Hours | Estimated Cost | Project Type | Pro |
| Public Visitation – Infrastructure - Install a public restroom | RI, DB | 120 | \$25,000 | DEV | Acc |
| | | | | | |

(i) Table Legend:

(2) Budget Category

(3) *ST = Short Term Project* *LT = Long-Term Project*

(4) *AD = Administrative* *EN = Enhancement*

(5) Project Lead

RI = Region I
HB = Habitat Branch
NB = Nongame Branch
IB = Information/Education Branch
DB = Development Branch
FB = Fisheries Branch

(6) Project Type

O&M = Operation & Maintenance
DEV = Development
ENH = Enhancement
PS = Professional Services

Fund Types:

IIPAM = Heritage Funds (non-acquisition) HLA = Heritage Land Acquisition Funds
FA = Federal Aid Funds HAC = Heritage Access Funds
WCF = Waterfowl Conservation Funds HED= Heritage Education Funds

* = PILT payment estimates based on maximum potential 2% increase in property tax assessment per year



August 17th 2022

RE: Support Letter for Little Colorado River Habitat Improvement Project – Arizona Water Protection Fund Fiscal Year 2023 Grant Cycle

Dear Arizona Water Protection Fund Commissioners:

On behalf of the Native Aquatics Program within the Arizona Game and Fish Department, I would like to express support for the grant request to the Arizona Water Protection Fund for the Little Colorado River Habitat Improvement Project. The goals of the project to improve morphological and ecological diversity of the Little Colorado River will benefit numerous native aquatic species, including federally listed species and species of greatest conservations concern within the state. Both direct and indirect benefits to native aquatic species will arise from the implementation of this project such as reconnecting relic floodplains and backwaters to increase the frequency of needed out of bank flows, decreasing ongoing bank erosion problems which has led to increased sedimentation, and establishing native plant species within the new wetlands and riparian habitats. The proposed project will provide numerous benefits to Arizona native species and aquatic resources for many years to come.

Thank you for the opportunity to provide support for this project, if you have any questions please contact me.

A handwritten signature in black ink, appearing to read "Curt Gill".

Curt Gill
Statewide Native Aquatics Program Manager
Arizona Game and Fish Department
cgill@azgfd.gov
623-236-7259



August 17th 2022

RE: Support Letter for Little Colorado River Habitat Improvement Project – Arizona Water Protection Fund Fiscal Year 2023 Grant Cycle

Dear Arizona Water Protection Fund Commissioners:

On behalf of the Region I Aquatic Wildlife Program within the Arizona Game and Fish Department, I would like to express support for the grant request to the Arizona Water Protection Fund for the Little Colorado River Habitat Improvement Project. The numerous goals of the project on the Little Colorado River and Becker Lake Wildlife Area will provide enhanced habitat for wildlife and recreational opportunities for people. By reconnecting disconnected floodplains, decreasing bank erosion, establishing native plant species, and adjusting the current river trails both terrestrial and aquatic wildlife will benefit. Additionally, the project goals will allow for natural river processes to occur for many decades to come, providing benefit to all users of this valuable resource. I am pleased to offer my support for this project and am excited for the numerous benefits it will provide to Arizona's wildlife and aquatic resources. If you have any questions please feel free contact me.

Thank you,

A handwritten signature in black ink, appearing to read "Ryan Follmuth".

Ryan Follmuth
Region I Aquatic Wildlife Program Manager
Arizona Game and Fish Department
rfollmuth@azgfd.gov
928-532-3692



3491 S. Gillenwater Drive
Flagstaff, AZ 86005
(928) 266-6192
george@oxbow-eco-eng.com

August 24, 2022

Reuben Terán | Executive Director
Arizona Department of Water Resources
ATTN: Arizona Water Protection Fund
1110 W. Washington Street, Suite #310
Phoenix, AZ 85007

RE: Letter of Commitment for Matching Funds for the Becker Lake Wildlife Area: Little Colorado River Habitat Improvement Project

Dear Reuben and the Proposal Evaluation Committee,

I am the owner, principal engineer, & Certified Ecological Restoration Practitioner (CERP) at Oxbow Ecological Engineering, LLC. I have been working with the Arizona Game & Fish Department (AGFD) on the development of the Becker Lake Wildlife Area Little Colorado Habitat Improvement Project since 2019 and I have provided grant assistance, project planning, survey, assessment, design, and compliance services as part of the project. I have also donated \$6,911.00 to complete a cultural resource survey for the project to help get it "shovel ready". I plan on continuing this collaboration with AGFD and will provide construction administration and monitoring services as part of the implementation phase. If this project is funded by AWPF, I intend to donate all mileage and lodging/per diem incurred to support the project, with an estimated total value of \$6,629.35. Please see the "Detailed Matching Funds Breakdown" spreadsheet for more information. I believe this is a really amazing project and am honored to be involved.

Sincerely,

A handwritten signature in black ink, appearing to read "George F. Cathey". The signature is written over a horizontal line that extends across the page.

George F. Cathey, PE, CERP



WHEN RECORDED, MAIL TO:

Apache Title and Trust

File #RV-4368

WARRANTY DEED

For the consideration of Ten Dollars, and other valuable considerations, I/We

CHERYL L. ENDERS, a married woman, as her sole and separate property, who acquired title as CHERYL L. HALL, single woman

as Grantor(s) do hereby convey to

THE STATE OF ARIZONA, by and through The Arizona Game and Fish Commission

as Grantee(s), the following described real property situated in Apache County, Arizona:

LEGAL DESCRIPTION ATTACHED HERETO AND MADE A PART HEREOF, MARKED EXHIBIT "A"

Together with all of Grantors right, title and interest in and to all appurtenant surface water, groundwater, water rights and claims, wells, ditches and ditch rights appurtenant to the Property, together with all easements, and rights of access including, without limitation, all of Seller's interest in the water rights described in EXHIBIT B attached hereto, whether the foregoing are known or unknown at the time of sale, settled and determined or subject to dispute, or hereafter adjudicated in any court or administrative proceedings.

EXEMPT FROM AFFIDAVIT AND FEE PER ARS 11-1134 (A)(3)

SUBJECT TO: Current taxes, assessments, reservations in patents and all easements, rights of way, encumbrances, obligations, liabilities, liens, covenants, conditions and restrictions as may appear of record.

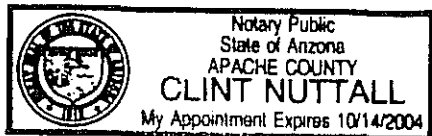
And I or we do warrant the title against all persons whomsoever, subject to the matters above set forth.

Dated this 7th day of January, 2002.

Cheryl L Enders
Grantor-Cheryl L. Enders

STATE OF ARIZONA)
) :ss
COUNTY OF Apache)

This instrument was acknowledged before me this 8 day of January, 2002 by Cheryl L. Enders



Clint Nuttall
Notary Public

My commission expires:

EXHIBIT "A" (Page 1 of 4)

PARCEL NO. 1:

The West half of the Northeast quarter of Section 30, Township 9 North, Range 29 East of the Gila and Salt River Base and Meridian, Apache County, Arizona.

PARCEL NO. 2:

That portion of the Northeast quarter of Section 32, Township 9 North, Range 29 East of the Gila and Salt River Base and Meridian, Apache County, Arizona, described as follows:

BEGINNING at the North quarter corner of said Section 32, said point being the TRUE POINT OF BEGINNING;

thence South $89^{\circ}48'03''$ East, along the North line of said Section 32, a distance of 1331.98 feet;

thence South $21^{\circ}49'15''$ East, a distance of 198.07 feet;

thence South $20^{\circ}56'35''$ West, a distance of 191.75 feet;

thence South $19^{\circ}53'23''$ West, a distance of 24.65 feet;

thence South $39^{\circ}17'55''$ West, a distance of 86.61 feet;

thence South $01^{\circ}41'36''$ East, a distance of 13.60 feet;

thence South $50^{\circ}13'33''$ West, a distance of 1.29 feet;

thence South $02^{\circ}24'23''$ East, a distance of 906.39 feet;

thence South $00^{\circ}44'11''$ West, a distance of 466.82 feet;

thence South $35^{\circ}26'56''$ West, a distance of 218.51 feet;

thence South $89^{\circ}57'05''$ West, a distance of 1141.87 feet;

thence North $07^{\circ}57'52''$ East, a distance of 328.83 feet;

thence North $77^{\circ}39'30''$ West, a distance of 68.79 feet;

thence North $00^{\circ}30'56''$ West, a distance of 334.16 feet to a 1/16th section corner;

thence North $00^{\circ}30'56''$ West a distance of 1349.10 feet to the TRUE POINT OF BEGINNING.

EXCEPT therefrom any portion lying in the South half of the Southwest quarter of the Northeast quarter of said Section 32.

EXHIBIT "A" (Page 2 of 4)

PARCEL NO. 3:

All that portion of the Northeast quarter of the Northwest quarter of Section 32, Township 9 North, Range 29 East of the Gila and Salt River Base and Meridian, Apache County, Arizona, lying East of the Becker Lake Roadway;

EXCEPT for the following described parcel:

From the Northwest one-sixteenth corner of said Section 32;
thence South $89^{\circ}45'28''$ East along the one-sixteenth line a distance of 736.55 feet to the TRUE POINT OF BEGINNING, said point being in the West Rights-of-Way limits of Becker Lake Road;
thence North $06^{\circ}09'00''$ West along the West line of said Right-of-way a distance of 266.70 feet to a 1/2 inch rebar with a tag marked LS 13014;
thence North $06^{\circ}21'43''$ West a distance of 263.42 feet to a 1/2 inch rebar with a tag marked LS 13014;
thence North $06^{\circ}21'43''$ West a distance of 198.60 feet to a 5/8 inch rebar with a plastic cap marked LS 13014;
thence North $78^{\circ}43'10''$ East a distance of 158.40 feet to a 5/8 inch rebar with a plastic cap marked LS 13014;
thence South $47^{\circ}05'42''$ East a distance of 65.65 feet to a 5/8 inch rebar with a plastic cap marked LS 13014;
thence South $29^{\circ}24'20''$ East a distance of 202.48 feet to a 5/8 inch rebar with a plastic cap marked LS 13014;
thence South $48^{\circ}03'17''$ West a distance of 146.19 feet to a 5/8 inch rebar with a plastic cap marked LS 13014;
thence South $19^{\circ}36'10''$ West a distance of 115.75 feet to a 5/8 inch rebar with a plastic cap marked LS 13014;
thence South $00^{\circ}38'05''$ East a distance of 74.66 feet to a 5/8 inch rebar with a plastic cap marked LS 13014;
thence South $14^{\circ}52'53''$ East a distance of 125.09 feet to a 5/8 inch rebar with a plastic cap marked LS 13014;
thence South $15^{\circ}08'20''$ East a distance of 136.60 feet to a 5/8 inch rebar with a plastic cap marked LS 13014;
thence South $89^{\circ}58'07''$ West a distance of 144.13 feet to the TRUE POINT OF BEGINNING.

EXHIBIT "A" (Page 3 of 4)

PARCEL NO. 4:

That portion of the Southeast quarter and the Northeast quarter of the Southwest quarter of Section 29, Township 9 North, Range 29 East of the Gila and Salt River Base and Meridian, Apache County, Arizona, described as follows:

BEGINNING at the South quarter corner of said Section 29, said point being the TRUE POINT OF BEGINNING;

thence North 00°43'20" East along the Western boundary of the Southeast quarter of said Section 29, a distance of 1329.15 feet to the Center-South 1/16 corner of said Section 29;

thence South 89°53'01" West along the Southern boundary of the Northeast quarter of the Southwest quarter of said Section 29, a distance of 99.69 feet;

thence North 00°43'20" East a distance of 417.54 feet;

thence South 89°31'37" East a distance of 99.69 feet;

thence North 00°43'20" East along the Western boundary of the Southeast quarter of said Section 29, a distance of 374.40 feet;

thence North 88°49'48" East, a distance of 474.94 feet;

thence North 27°35'15" East, a distance of 99.21 feet;

thence North 04°13'26" West, a distance of 160.59 feet;

thence North 37°38'44" East, a distance of 12.27 feet;

thence South 26°22'25" East, a distance of 371.13 feet;

thence North 31°21'35" East, a distance of 58.00 feet;

thence South 26°22'27" East, a distance of 1203.23 feet;

thence South 63°58'58" West, a distance of 200.00 feet;

thence South 36°24'36" East, a distance of 375.11 feet;

thence South 00°24'06" West, a distance of 490.79 feet;

thence South 01°22'24" East, a distance of 110.21 feet;

thence South 22°27'23" East, a distance of 44.27 feet;

thence North 89°48'03" West, a distance of 1331.98 feet to the TRUE POINT OF BEGINNING.

EXHIBIT "A" (Page 4 of 4)

PARCEL NO. 5:

The South half of the Southwest quarter of Section 29, Township 9 North, Range 29 East of the Gila and Salt River Base and Meridian, Apache County, Arizona;

EXCEPT the following described parcel:

COMMENCING at a 2 inch aluminum cap monument stamped LS 8906 located at the Section corner common to Sections 29, 30, 31 and 32 of said Township and Range; thence bear South $89^{\circ}46'16''$ East along the Section line common to Sections 29 and 32, a distance of 1038.05 feet to the TRUE POINT OF BEGINNING;

thence North $35^{\circ}17'33''$ East along the Northwest boundary of the Springerville Municipal Airport, 328.32 feet to a point;

thence South $39^{\circ}31'26''$ East, 349.55 feet to a point on the Section line common to Sections 29 and 32;

thence North $89^{\circ}46'44''$ West, 131.96 feet to the West 1/16 corner of Sections 29 and 32;

thence North $89^{\circ}46'16''$ West, 280.18 feet to the TRUE POINT OF BEGINNING.

**Enders Property
Description of Water Rights**

Norviel Decree Water Rights (Irrigation)

| <u>Right No.</u> | <u>Source</u> | <u>Place of Use</u> | <u>Acres</u> |
|-----------------------------|-----------------------|--|--------------|
| 1918 03B.05/ 1918 03B.12 | Little Colorado River | SWNE 32 T9N R29E | 20 |
| 1918 05A.02 | Little Colorado River | SESW 29 T9N R29E SWSE 29 T9N R29E NENW 32 T9N R29E NWNE 32 T9N R29E | 43 |

Statements of Claimant (39s)

| <u>File No.</u> | <u>Source</u> | <u>Associated Filings</u> |
|---------------------------|-----------------------|--|
| 39-89292 (irrigation) | Little Colorado River | Norviel Decree Rights (1918 03B.05/03B.12) |
| 39-89293 (stockpond) | Little Colorado River | Norviel Decree Rights (1918 05A.02) |
| 39-92045 (stockpond) | Little Colorado River | None |
| 39-89297 (irrigation) | Little Colorado River | Norviel Decree Rights (1918 05A.02) |
| 39-89298 (stock watering) | Little Colorado River | Norviel Decree Rights (1918 03B.05/03B.12 and 05A.02) |
| 39-92046 (irrigation) | Little Colorado River | Norviel Decree Rights (1918 05A.02) |

at the request of Arizona Game & Fish Commission

When recorded, mail to Arizona Game and Fish Commission c/o Robert D. Curtis 2222 West Greenway Road Phoenix, Arizona 85023

Witness my hand and official seal. Virgie Heap, County Recorder By *May [Signature]* Deputy Recorder

Compared Photostated Fee:

Order No. WARRANTY DEED

For the consideration of Ten and 00/100 Dollars, and other valuable considerations, I, or we, BECKER TRUST COMPANY, INC. of Springerville, Arizona, the GRANTORS do hereby convey to STATE OF ARIZONA, by and through its Game and Fish Commission, the GRANTEES

the following described real property situate in Apache County, Arizona: SE 1/4 SE 1/4 of Sec. 19, SW 1/4 SW 1/4 of Sec. 20, W 1/2 NW 1/4 and NW 1/4 SW 1/4 of Sec. 29, E 1/2 NE 1/4 and NE 1/4 SE 1/4 of Sec. 30, T. 9N., R. 29E., and a parcel of land in Sec. 20, T. 9N., R. 29E., G. S. R. B. M., described as follows:

Beginning at a point 1,012 feet North of the SW corner of the SE 1/4 SW 1/4 of Sec. 20, T. 9N., R. 29E.; thence North 1,285 feet; thence East 462 feet; thence South 2,122 feet more or less to the center of U. S. Highway 60; thence in a Northwesterly direction along the center of U. S. Highway 60 a distance of 944 feet more or less; thence West 30 feet more or less to the point of beginning.

Together with any and all appurtenant and appropriated water rights from the Little Colorado River as provided in the Judgement and Decree entered under the date of April 29, 1918, in Cause entitled The St. Johns Irrigation Co., et al, Plaintiffs, vs. Round Valley Water Storage & Ditch Company, et al, Defendants, to wit: First Reservoir Right, Becker Lake; 421.48 acre feet; date of appropriation, 1883 and River Rights - 13th on 20 acres in E 1/2 SW 1/4, and the NW 1/4 SE 1/4 of Sec. 20, T9N., R. 29E., date of appropriation, 1881 and 15th Right on 35 acres in W 1/2 NW 1/4, Sec. 29 and SW 1/4 SW 1/4, Sec. 20, T. 9N., R. 29E., date of appropriation, 1883, along with canals and ditches and rights-of-way therefore in conveying said water to said lands as described in EXHIBIT A. (This deed is a correction to the Warranty Deed recorded in DKT 185, pages 74 and 75, dated January 18, 1974.) And the Grantor do warrant the title against all persons whomsoever, subject to the matters above set forth.

Dated this 29th day of May, 1974 BECKER TRUST COMPANY, INC. *E.C. Becker* E. C. Becker, Secretary and Treasurer

STATE OF ARIZONA, } This instrument was acknowledged before me this 29th day of County of Apache } ss. May, 1974 by the Grantors. *E.C. Becker, Secy & Treas for Becker Trust Co.* *Cresbie A. Hand* Notary Public

My commission will expire

STATE OF ARIZONA, } This instrument was acknowledged before me this 29 day of County of Apache } ss. May 1974 by the Grantors. *Cresbie A. Hand* Notary Public

My commission will expire

My Commission Expires Mar. 3, 1976 DKT 191 PAGE 554

Beginning at the point where the centerline of the water conveyance ditch intersects the East line of the W 1/2 W 1/2 Section 29, Township 9 North, Range 29 East, Gila and Salt River Base and Meridian, said point bearing North 31° 13' 10" East a distance of 2,518.18 feet from the SW corner Section 29, thence along the centerline of said water conveyance ditch South 66° 07' 59" East, 132.82 feet to a point, thence South 70° 47' 16" East, 98.37 feet to a point, thence South 77° 24' 44" East, 91.63 feet to a point, thence South 42° 29' 37" East, 66.45 feet to a point, thence South 35° 07' 36" East, 78.76 feet to a point, thence South 14° 14' 22" East, 129.20 feet to a point, thence South 22° 26' 39" East, 171.01 feet to a point, thence South 11° 51' 31" East, 4.91 feet to a point, thence South 15° 12' 31" East, 275.87 feet to a point, thence South 0° 41' 43" West, 65.93 feet to a point, thence South 15° 34' 16" West, 79.68 feet to a point, thence South 8° 25' 26" West, 151.13 feet to a point, thence South 10° 31' 45" East, 43.89 feet to a point, thence South 7° 10' 17" East, 190.33 feet to a point, thence South 11° 46' 20" East, 142.19 feet to a point, thence South 35° 30' 24" East, 204.46 feet to a point, thence South 12° 46' 20" West, 129.41 feet to a point, thence South 27° 54' 19" West, 65.96 feet to a point, thence South 21° 23' 35" East, 85.91 feet to a point, thence South 41° 58' 22" East, 113.15 feet to a point, thence South 38° 09' 43" East, 163.20 feet to a point, thence South 24° 59' 58" East, 37.98 feet to a point, thence South 13° 46' 03" West, 120.01 feet to a point, thence South 8° 02' 44" East, 132.32 feet to a point, thence South 12° 25' 01" East, 140.40 feet to a point, thence South 7° 39' 01" West, 55.21 feet to a point, thence South 19° 09' 33" East, 62.04 feet to a point, thence South 12° 19' 58" East, 122.38 feet to a point, thence South 13° 46' 59" East, 143.26 feet to a point, thence South 31° 20' 35" East, 84.45 feet to a point, thence South 7° 44' 41" West, 32.80 feet to a point, thence South 48° 16' 02" West, 75.68 feet to a point, thence South 45° 33' 14" West, 55.58 feet to a point, thence South 18° 42' 37" West, 44.11 feet to a point, thence South 15° 05' 11" West, 115.92 feet to a point, thence South 14° 28' 12" East, 56.71 feet to a point, thence South 18° 12' 09" East, 50.64 feet to a point, thence South 13° 35' 45" East, 174.54 feet to a point, thence South 32° 55' 30" East, 50.06 feet to a point, thence South 55° 29' 18" East, 72.72 feet to a point, thence South 76° 12' 29" East, 212.25 feet to a point, thence South 81° 07' 07" East, 102.34 feet to a point, thence South 61° 31' 39" East, 90.83 feet to a point, thence South 26° 52' 28" East, 159.04 feet to a point, thence South 2° 19' 30" East, 65.81 feet to a point, thence South 1° 20' 35" East, 188.58 feet to a point, thence South 42° 16' 16" West, 85.40 feet to a point, thence South 58° 20' 05" West, 79.28 feet to a point, thence South 01° 39' 32" East, 354.42 feet to a point, thence South 00° 19' 01" East, 119.27 feet to a point, thence South 2° 58' 22" East, 170.46 feet to a point, thence South 0° 56' 25" East, 73.13 feet to a point, thence South 0° 46' 58" East, 65.16 feet to a point, thence South 4° 50' 32" West, 370.92 feet to a point, thence South 9° 52' 48" West, 66.32 feet to a point, thence South 56° 12' 01" East, 30.47 feet to a point, thence South 11° 47' 08" East, 89.55 feet to a point, thence South 18° 10' 19" East, 95.78 feet to a point, thence South 06° 07' 12" West, 49.43 feet to a headgate, the point of diversion on the Little Colorado River.

ANGIERA
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Evidence of Physical and Legal Availability of Water

The habitat improvement project aims to enhance riverscape function by relocating and improving portions of the River Walk Trail to create a riparian buffer and restoring degraded floodplain and streambank features, with all work focused outside of the delineated ordinary high-water mark and jurisdictional wetland areas. Because of the nature of the project, no water resources (0-acre-ft per year) are necessary to meet project objectives. For additional details of existing Little Colorado River water rights for Becker Lake Wildlife Area, refer to Exhibit "B" of the warranty deed for the property (Attached: 2002-00124 - Enders).

EXHIBIT "B"

2002-00124 01/08/2002 Page 6 of 6

**Enders Property
Description of Water Rights**

Norviel Decree Water Rights (Irrigation)

| <u>Right No.</u> | <u>Source</u> | <u>Place of Use</u> | <u>Acres</u> |
|-----------------------------|-----------------------|--|--------------|
| 1918 03B.05/ 1918 03B.12 | Little Colorado River | SWNE 32 T9N R29E | 20 |
| 1918 05A.02 | Little Colorado River | SESW 29 T9N R29E SWSE 29 T9N R29E NENW 32 T9N R29E NWNE 32 T9N R29E | 43 |

Statements of Claimant (39s)

| <u>File No.</u> | <u>Source</u> | <u>Associated Filings</u> |
|---------------------------|-----------------------|--|
| 39-89292 (irrigation) | Little Colorado River | Norviel Decree Rights (1918 03B.05/03B.12) |
| 39-89293 (stockpond) | Little Colorado River | Norviel Decree Rights (1918 05A.02) |
| 39-92045 (stockpond) | Little Colorado River | None |
| 39-89297 (irrigation) | Little Colorado River | Norviel Decree Rights (1918 05A.02) |
| 39-89298 (stock watering) | Little Colorado River | Norviel Decree Rights (1918 03B.05/03B.12 and 05A.02) |
| 39-92046 (irrigation) | Little Colorado River | Norviel Decree Rights (1918 05A.02) |



Arizona

Department of Environmental Quality

LITTLE COLORADO RIVER TMDL FOR TURBIDITY

AUGUST 2002



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LIST OF ABBREVIATIONS

- ADEQ - Arizona Department of Environmental Quality
- ADHS - Arizona Department of Health Services
- AGFD - Arizona Game and Fish Department
- ALRIS - Arizona Land Resource Information System
- AZ - Arizona
- BLM - Bureau of Land Management
- BMP - Best Management Practices
- cfs - Cubic Feet Per Second
- EPA - Environmental Protection Agency
- ft - Feet
- in - Inches
- LA - Load Allocation
- lbs/day - Pounds per Day
- LCR - Little Colorado River
- mg/L - Milligrams Per Liter
- mgd - Millions of Gallons Per Day
- MOS - Margin Of Safety
- NTU - Nephelometric Turbidity Units
- Q - Discharge
- TMDL - Total Maximum Daily Load
- TSS - Total Suspended Solids
- USEPA- United States Environmental Protection Agency
- USFS - United States Forest Service
- USGS - United States Geological Survey
- WLA - Waste Load Allocation
- WQS - Water Quality Standard

EXECUTIVE SUMMARY

Section 303(d) of the Clean Water Act requires that States develop Total Maximum Daily Loads (TMDLs) for surface waters that do not meet, and maintain, applicable water quality standards (WQSs). A TMDL sets the amount of a given pollutant that the water body can assimilate without creating an impairment of that surface water's designated use. The TMDL by definition (40 CFR Part 130) is the sum of all Waste Load Allocations (WLAs) (point sources) and Load Allocations (LAs) (non-point sources) with the inclusion of a margin of safety (MOS) and natural background conditions.

The Little Colorado River (LCR) is located in southern Apache County, AZ near the border with New Mexico. Its headwaters originate in the White Mountains along the northern and eastern slopes of Mount Baldy (11,043 feet (ft.)) (Fig. 1). The river flows east-northeast until it reaches Eagar, AZ where it turns to a more northerly course. Two segments, totaling 16 miles, of the LCR, near Springerville, AZ, were listed as impaired due to violations of the turbidity standard for Aquatic and Wildlife coldwater streams, which is 10 NTU. The first segment, Water Canyon Creek to Nutrioso Creek (HUC 15020001-010), is 4 miles long. The second segment, Nutrioso Creek to Carnero Creek (HUC 15020001-009), is 12 miles long.

The LCR was placed on the 303(d) List based on sampling taken from 1991 through 1996 (see Table 1). From June to October 2000, the Arizona Department of Environmental Quality (ADEQ) conducted an intensive turbidity study of the LCR. Eighteen monitoring sites were established along the LCR from the intersection of Highways 260 and 373 (near Greer) to the end of the listed reach. The results indicate that the turbidity impairment actually starts upstream of the confluence of the LCR with Water Creek Canyon (Site 35). Field observations indicated that the main cause of turbidity is loss of vegetative cover due to historic and current grazing practices. The loss of vegetation, especially riparian, allows increased runoff, soil erosion, and bank destabilization.

The turbidity impairment appears to be directly correlated to large flow events that occur during the Winter-Spring rain/snowmelt season and during the Summer-Fall monsoon season. These correlations were developed based on United States Geological Survey (USGS) historic flow data for the LCR. TMDL values were developed for each season to reflect these differences in flow regimes and resultant sediment delivery mechanisms. Because turbidity is a dimensionless unit, site specific TSS versus turbidity correlations were created for this TMDL. These correlations link TSS values in milligrams per liter (mg/L) to turbidity standards and measurements. Target Load Reductions of TSS will equate to reductions of turbidity.

Table 1 Summary of Turbidity Data on LCR Used to Make Listing Decision

| Segment | Agency Program Site Description | Year - Number of Samples | Results Range ¹ (NTU) | Samples Exceeding Standards (Exceedance Rate) |
|-------------------------------|--|----------------------------------|----------------------------------|---|
| Water Canyon - Nutrioso Creek | ADEQ FSN Hwy 60 Bridge (TMDL sample site 90) | 1994 - 6 | 7.06 - 96.4 | 12 of 18 (67% exceedance) |
| | | 1995 - 6 | | |
| | | 1996 - 6 | | |
| Nutrioso Creek - Carnero | ADEQ Biocriteria Below Nutrioso | 1992 - 1 | 16.2 | 1 of 1 (100% exceedance) |
| | ADEQ FSN Below Springerville | 1991 - 5 1992 - 6 1993 - 3 | 3.9 - 47 | 7 of 14 (50% exceedance) |

¹ The WQS for turbidity is 10 NTU.

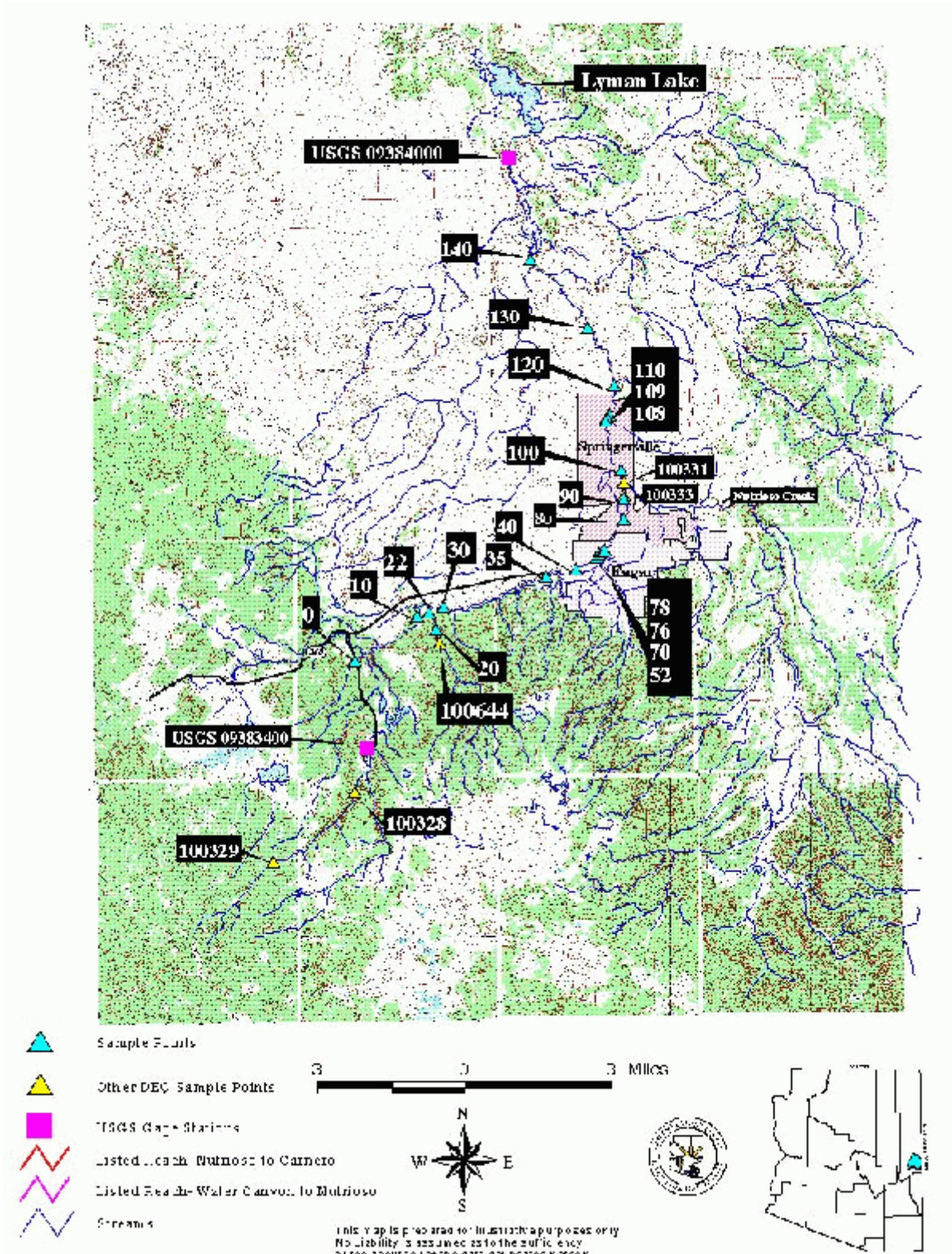
The target load capacity for the LCR during the Winter-Spring seasonal flows (28.9 cubic ft. per second (cfs)) was calculated to be 1,702 pounds per day (lbs./day) as Total Suspended Solids (TSS) (Table 2). The Measured Load was estimated to be 6,959 lbs./day. Using a 10% explicit MOS, the Load Reduction necessary is 5,257 lbs./day. During the Summer-Fall seasonal flows (13.1 cfs), the target load capacity was calculated to be 681 lbs./day. The Measured Load is 2,509 lbs./day. Using a 25% MOS, the Load Reduction necessary is 1,828 lbs./day.

Table 2 TMDL Summary Table For The Little Colorado River

| WINTER-SPRING FLOWS (FEB-MAY) | | SUMMER-FALL FLOWS (JUN-SEP) | |
|--|-------|--|-------|
| <i>Designed for 28.9 cfs (18.9 mgd)</i> | | <i>Designed for 13.1 cfs (8.5 mgd)</i> | |
| <i>Background, lbs./day TSS</i> | 354 | <i>Background, lbs./day TSS</i> | 354 |
| <i>Waste Load Allocation, lbs./day TSS</i> | 0 | <i>Waste Load Allocation, lbs./day TSS</i> | 0 |
| <i>Load Allocation, lbs./day TSS</i> | 1,225 | <i>Load Allocation, lbs./day TSS</i> | 262 |
| <i>Margin of Safety, lbs./day TSS</i> | 123 | <i>Margin of Safety, lbs./day TSS</i> | 65 |
| <i>TMDL, lbs./day TSS</i> | 1,702 | <i>TMDL, lbs./day TSS</i> | 681 |
| <i>Measured Load, lbs./day TSS</i> | 6,959 | <i>Measured Load, lbs./day TSS</i> | 2,509 |
| <i>Load Reduction, lbs./day TSS</i> | 5,257 | <i>Load Reduction, lbs./day TSS</i> | 1,828 |

Implementation projects and best management practices (BMPs) should be aimed at decreasing the contributions of sediment during higher flow events. Effective methods include increasing riparian vegetation, stream bank stabilization, promotion of flood plain development, and minimization of the impact of cattle in the general area. This can be accomplished by watershed improvements on uplands and riparian areas, road maintenance or closures, and improved grazing strategies and practices.

Figure 1 Project Area



1 BACKGROUND INFORMATION

1.1 Geography

The LCR is located in southern Apache County, AZ, near the border with New Mexico. The headwaters originate in the White Mountains along the northern and eastern slopes of Mount Baldy (11,403 ft.) (Fig. 1). The river flows east-northeast until it reaches Eagar, AZ, where it turns to a more northerly course.

1.2 Geology

The rugged upper part of the watershed near Mount Baldy is mid to late Tertiary volcanics (Reynolds, 1988). The listed reach flows mainly through upper Tertiary and upper Quaternary volcanics (Reynolds, 1988). The area is also the site of the Springerville volcanic field, which contains over 380 cinder cones and flows (ASU, 2001). Soils in the study area generally fall into three categories: 1) sandy on steep slopes around Greer; 2) shallow, basaltic, and stony near the South Fork confluence; 3) alluvial, with higher clay concentrations in the Springerville/Eagar vicinity (ADEQ, 1982).

1.3 Hydrology

The LCR watershed above Lyman Lake drains approximately 774 square miles (Arizona Department of Health Services (ADHS), 1982). The LCR is a perennial stream that responds primarily to two seasonal events: a Winter-Spring snowmelt and rain season from February to mid-May and a Summer-Fall monsoon event season from June through September. Two USGS gauge stations are present on LCR. USGS gage # 09384000 is located above Lyman Lake, near St. John's, AZ, and USGS Gage # 09383400 is located near Greer, AZ. The major tributaries to the LCR are South Fork, Grapevine Creek, Water Canyon Creek, Nutrioso Creek, and Carnero Creek. The stream portions above the confluence with South Fork are generally steep and store little sediment. Below the confluence with South Fork, the gradient and stream velocity decreases.

Data from over 60 years of record (1940 to 2000) for USGS gage station #09384000, above Lyman Lake, were used to calculate the average flow for each day of the year. Winter-Spring season (Nov 1 to May 31) flow values average 28.9 cfs. The average flow for the Summer-Fall season (Jun 1 to Oct 31) is 13.1 cfs. The average base flow was also calculated and found to be 11.0 cfs, however the calculations were not carried over to the average base flow value, because these Winter-Spring and Summer-Fall TMDL values represent the critical condition for the LCR for sediment and, thus, turbidity impairments.

1.4 Climate

Climate varies greatly throughout the reach. The higher elevations generally receive more precipitation (annual average of 23.39 inches (in.) near Greer, AZ and 12 in. near Springerville, AZ). Precipitation is primarily rain and snow in the higher elevations and rain in the lower elevations. Summers in the higher elevations are warm in the day, averaging a maximum of 76E in July, and cool at night, averaging a minimum of 47E in July. Summers in the lower elevations are often hot, averaging a maximum of 82-90E in the day and, at night, averaging a minimum of 51-57E in July.

1.5 Vegetation

The LCR transects many ecosystems (Fig. 2). Vegetative species are predominantly spruces and firs above 9,500 ft., ponderosa pines and mixed conifers above 8,000 ft, and pinon pine/juniper and grasslands at the lower elevations. A very marked transition between the pines and the grasslands occurs around 7,400 ft. (ADHS, 1982).

1.6 Land Use

According to the land ownership information provided by Arizona Land Resource Information System (ALRIS), the LCR watershed is a mixture of Federal, State, and private lands (Fig. 3). Land ownership is comprised of 45% United State Forest Service (USFS) Apache-Sitgreaves National Forest lands, 37% Arizona State Trust lands, and 17% private party ownership.

The remaining 1% is Arizona Game and Fish Department (AGFD), Bureau of Land Management (BLM), and White Mountain Apache lands. The major land use along the listed reach is agriculture and open range. Figure 4 shows land use type and percentage of total area.



Figure 2 Representative Ecosystems

Figure 3 Land Ownership

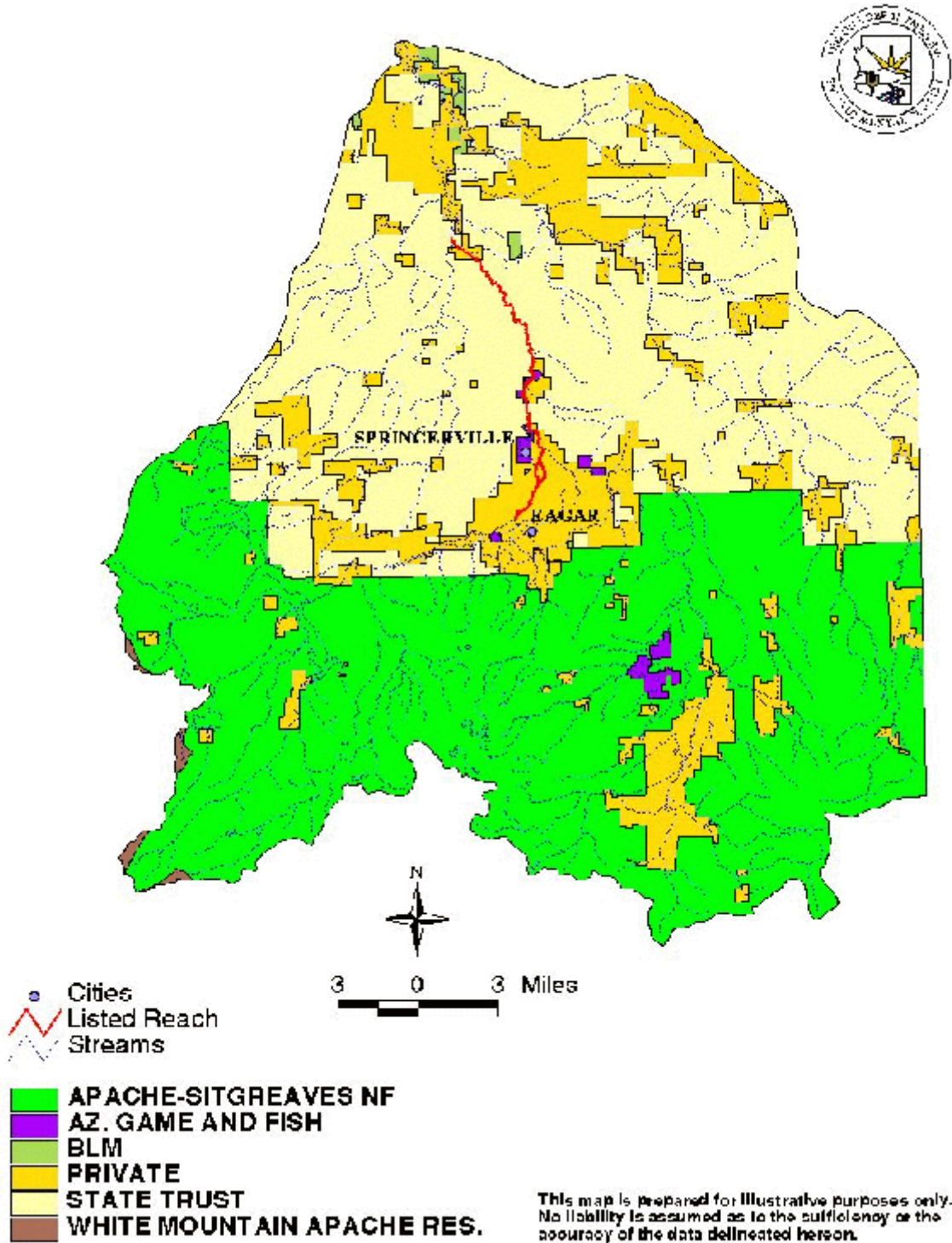
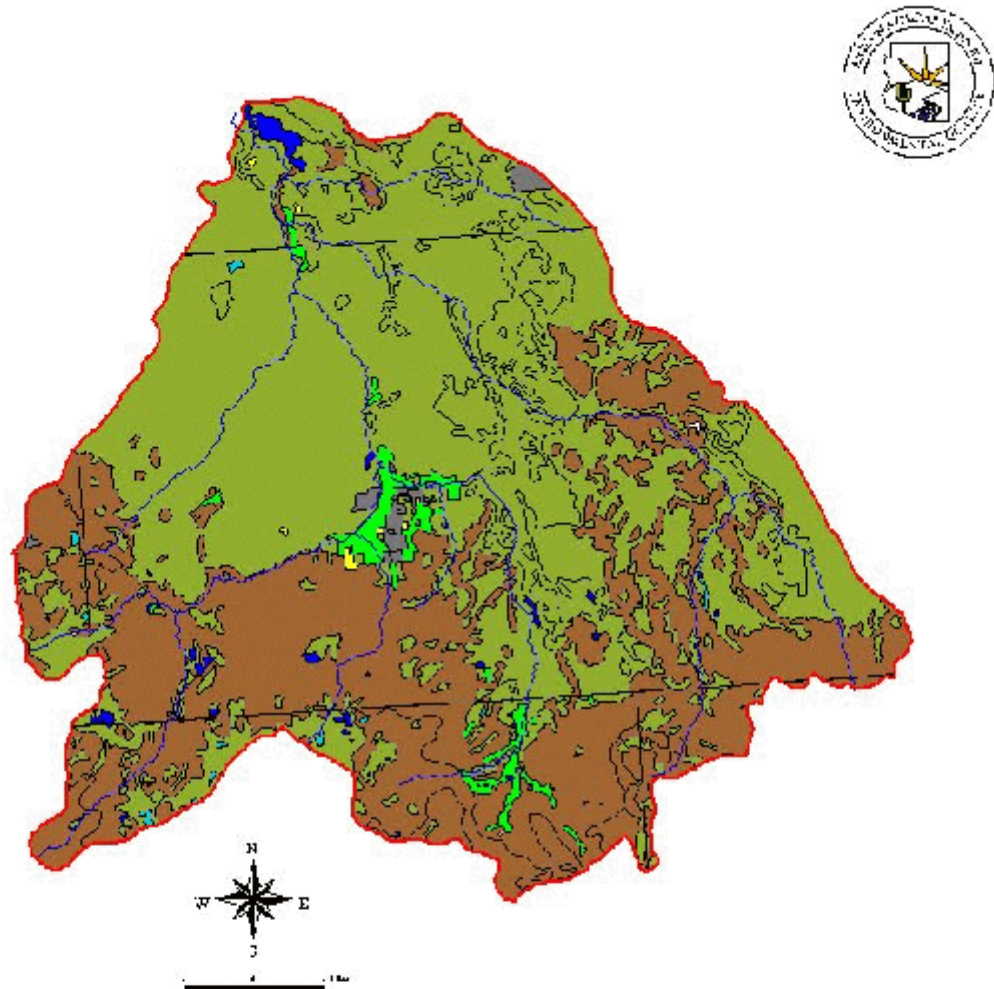


Figure 4 Land Use



Land Use Type & Percentage of Total Area

| | |
|-------------------|------|
| Urban | <1% |
| Agricultural Land | 1.8% |
| Rangeland | 59% |
| Forest Land | 28% |
| Lakes & Streams | <1% |
| Wetland | <1% |
| Unclassified | <1% |

This map is prepared for illustrative purposes only.
No liability is assumed as to the suitability or the
accuracy of the data delineated hereon.

2 ENDPOINT IDENTIFICATION

2.1 Turbidity and the Linkage of Water Quality Standards and Pollutants

The United States Environmental Protection Agency's (USEPA's) recommended approach to the development of TMDLs with limited data is to develop estimates comprised of the best methods and data available (USEPA, 1999).

Turbidity is a measure of the refraction of light, caused by the scattering of the photons, as it passes through a sample of water. Although this can be due to a variety of causes, the turbidity standard was created as an indirect measure to protect aquatic life from impacts due to excessive sedimentation and excessive algal blooms.

2.2 Identification and Description of Pollutant Sources

In the 1998 303(d) list, the LCR is listed as impaired for turbidity from Water Canyon Creek to Carnero Creek (ADEQ, 1998) (Table 1). From June to October 2000, ADEQ conducted a turbidity study of the LCR. Eighteen monitoring sites (Fig. 1) were established from the intersection of the Highways 260 and 373 (near Greer) and the LCR (Site 0) to the end of the listed reach (Site 140). The sample sites were selected to better define sources of turbidity. Sample results are included in Appendix A. The results indicate that the turbidity impairment actually starts upstream of the confluence with Water Canyon Creek (near Site 35).

2.2.1 Point Sources

No point sources were found on the LCR during ADEQ's investigations. There have been no National Pollutant Discharge Elimination System (NPDES) permits issued for this stretch of the river system.

2.2.2 Non-Point Sources

The turbidity impairment in the LCR is a result of excessive sediment from natural and anthropogenic sources that is flushed into the LCR system. A number of possible sources were identified during the field investigations.

2.2.2.1 Grazing and Wildlife

Ungulate grazing can contribute sediment to the system by disruption of the soil surface, soil compaction, removal of organic matter, and trailing. When ungulates overuse an area, there is the potential for increased soil loss, compaction, and accelerated overland flow. In riparian areas, grazing can reduce riparian vegetation, destabilize banks, and cause in-stream disturbances that reduce the functionality of the stream.

The free range grazing practices of the turn of the century had drastic impacts on the soil and vegetation of the LCR watershed (ADEQ, 2000).

Today, livestock still graze most of the watershed. Even though grazing practices have improved, improper livestock grazing is a source of fine grained sediment.

2.2.2.2 Stream Channel Instabilities

This portion of the LCR also suffers from a lack of riparian vegetation. The absence of vegetation in the stream course, which naturally slows the flow, contributes to higher velocities during high flows (Snyder, 1994). This causes down cutting of the stream. Down cutting of the channel creates a loss in flood plain for the stream which means that during high flows, like the critical flows, stream velocities are increased, thus increasing the shear stress/force acting upon the stream banks and increasing the erosional forces.

2.2.2.3 Road Systems

The USFS is mandated to maintain its system roads to certain standards. However, non-system roads created by recreationists undermine USFS efforts. The USFS expends much effort on closing non-system roads and reducing off-road travel; however, adequate funding is not always available. Other public roads are also a source of sediment. Road cuts, bridges, culverts, and other transportation features also impact the LCR.

2.2.2.4 Golf Course

The recent construction of a golf course on the LCR (Sites 70, 76, and 78) contributed sediment to the river. The golf course received a notice of violation from the ADEQ for violation of the surface WQS for turbidity. The golf course altered construction practices and implemented other BMPs to control sediment delivery to the LCR. Even though the golf course construction has been completed, there are several stretches of river within the property boundaries that would benefit from stream stabilization restoration.

2.2.2.5 Natural Conditions

Natural sediment contributions can be the result of geologic formations and processes and their interactions with the vegetation, soils, and wildlife. In addition to out-of-stream contributions, fine sediment which has been stored within the void spaces of larger bed materials, and flood plains and point bars, can be a source of turbidity. During large flow events, these fine sediments are re-suspended and transported further down the system. Organic suspended materials and organisms present in the water column can also effect the turbidity readings themselves by scattering the light of the turbidity meter in the same manner as suspended solids.

2.3 TMDL Calculation

Turbidity is not easily transferred into the TMDL framework because it is a dimensionless unit. Because of this, site specific TSS versus turbidity correlations were created for this TMDL. These correlations link TSS values in mg/L to turbidity standards and measurements. Target Load Reductions of TSS will equate to reductions of turbidity. This is useful as the increased turbidity during high flows is caused by higher TSS due to increased stream water velocities, shear stress, and stream power, which all result in higher erosional forces.

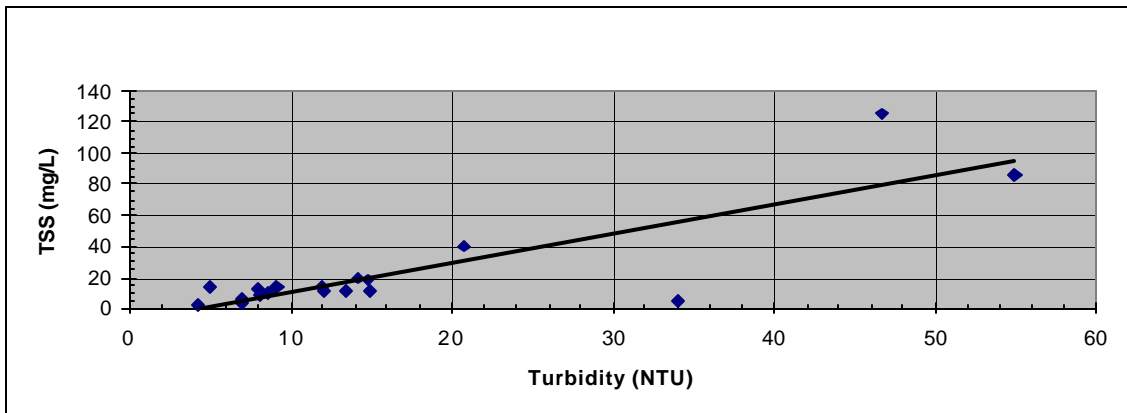
2.3.1 TSS Equations

The correlation graphs, and the resulting equations, are based on data obtained through field measurements, laboratory results for TSS, and historic records. This correlation allows a numeric estimate of the amount of sediment and turbidity present in the stream during critical flows. Two sets of data were created: a Winter-Spring set and a Summer-Fall set. This allows for the creation of a set of regressions and correlations that better represent seasonal conditions, and allow for the creation of more valid regressions between the data points. The average flow values were used to calculate a corresponding turbidity and TSS reading by utilizing the Turbidity & TSS vs. Discharge graphs and the TSS vs. Turbidity graphs.

Taken from the solution to the line best fitting the data in Figure 5, Winter-Spring, TSS vs. Turbidity

$$TSS = 1.8726(\text{turbidity}) - 7.8851, R^2 = 0.7008 \quad \text{Equation 1}$$

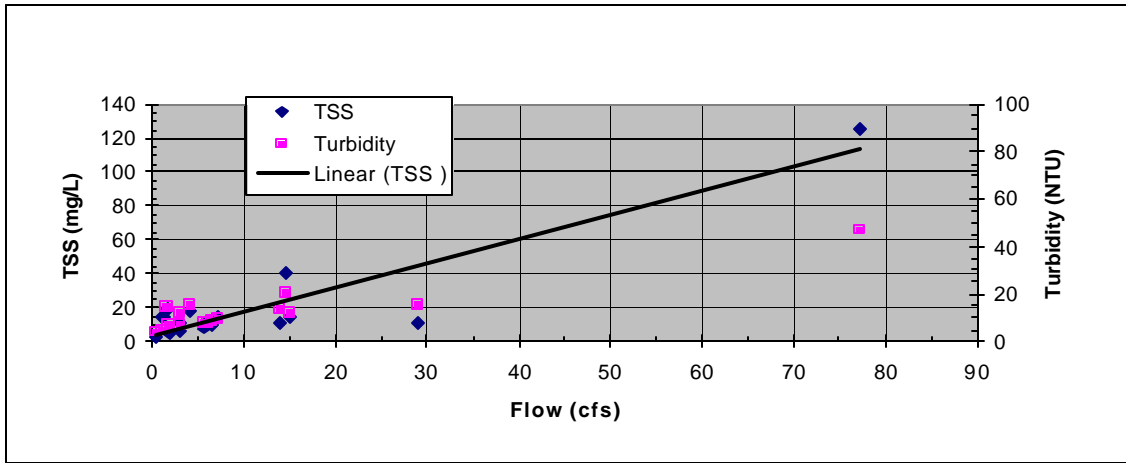
Figure 5 Winter-Spring, TSS vs. Turbidity



Taken from the solution to the line best fitting the data in Figure 6, Winter-Spring, TSS and Turbidity vs. Flow

$$TSS = 1.4232(Q) + 3.0976, R^2 = 0.8327 \quad \text{Equation 2}$$

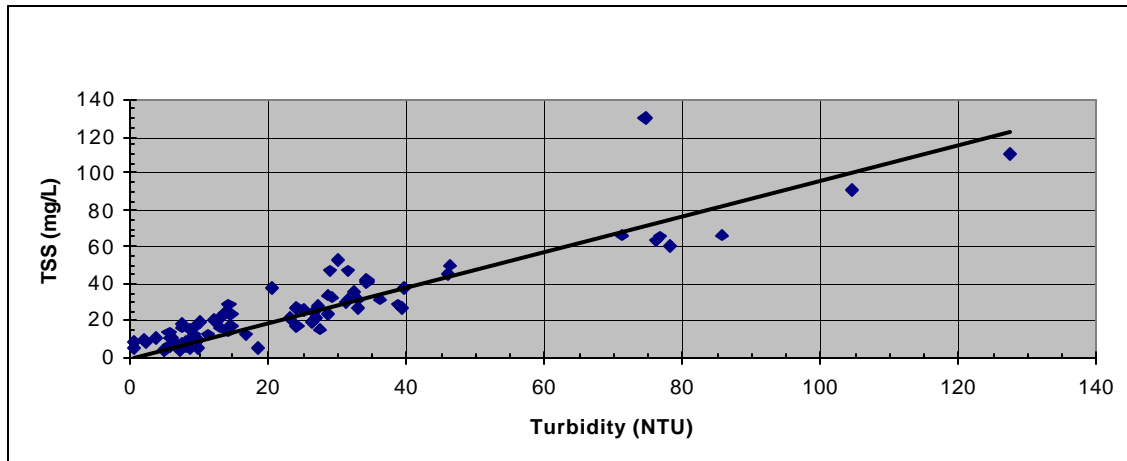
Figure 6 Winter-Spring, TSS and Turbidity vs. Flow



Taken from the solution to the line best fitting the data in Figure 7, Summer-Fall, TSS vs. Turbidity

$$\text{TSS} = 0.9644(\text{turbidity}), R^2 = 0.8055 \quad \text{Equation 3}$$

Figure 7 Summer-Fall, TSS vs. Turbidity

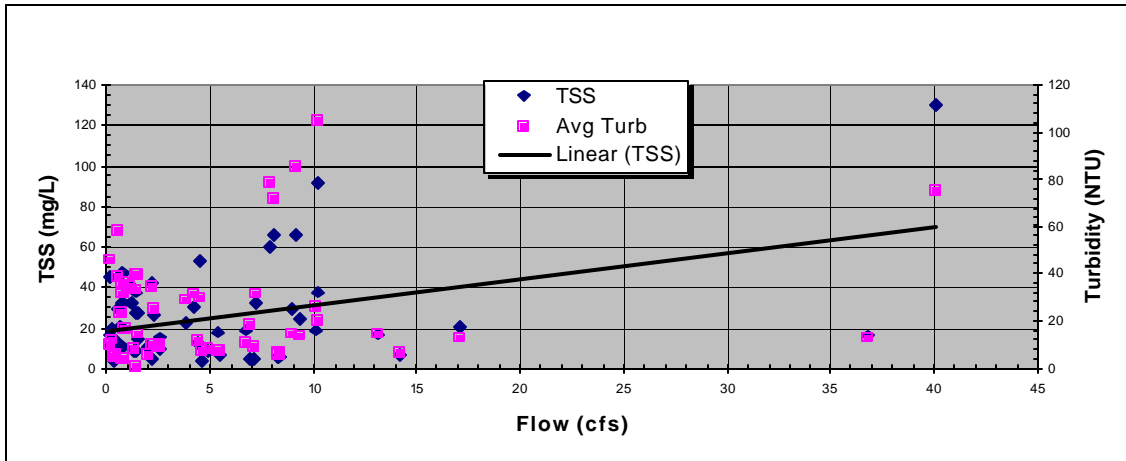


Taken from the solution to the line best fitting the data in Figure 8, Summer-Fall, TSS and Turbidity vs. Flow

$$\text{TSS} = 1.2616(Q) + 18.874, R^2 = 0.1682 \quad \text{Equation 4}$$

Figure 8 Summer-Fall, TSS and Turbidity vs. Flow

2.



3.2 Background Site Location and Values

In order to determine the natural background sediment load value, a search was conducted to identify another watershed consisting of the same geography, geology, hydrology, vegetation, channel morphology, and watershed size as the LCR watershed. Criteria for the search included:

- 1.) The potential site must lie within, or tributary to, the LCR watershed
- 2.) Must be an unlisted (303(d)) water body for exceedances of the surface water quality turbidity standard
- 3.) It should have no, or few, anthropogenic disturbances within it's watershed boundary
- 4.) There should be a sufficient amount of TSS and discharge data to perform the necessary calculations

No suitable site could be found that was near the same watershed size or flow regime as the LCR. Therefore, the search was modified to identify any relatively undisturbed, or unlisted, segment within the watershed, or a tributary to the LCR, that could be used to approximate natural background values. A section of the LCR was used to calculate the natural background values. The natural background conditions for sediment for the LCR were estimated by using two sampling locations upstream of identified nonpoint sources, and above the 303(d) listed segments of the LCR. These sample stations, 10 and 30 (Fig. 1), maintain the same geologic, hydrologic, and geomorphic conditions as the listed reach of the LCR. The channel is approximately the same size, and flows at the sampling

stations correspond well to flows in the main channel of the listed segment. To arrive at a value for the background load for sediment, the turbidity values from these sampling stations were averaged and correlated into a Total Suspended Solids value, and then calculated into a daily load.

The average of the turbidity readings taken by ADEQ at these sample stations through the TMDL sampling plan, was 6.2 NTU. These values were taken in the summer-fall season, so Equation 3 was used to calculate the corresponding TSS concentration of 5.9 mg/L. To convert the 5.9 mg/L into a daily load value for TSS, 5.9 mg/L TSS was input into the following equation.

$$Flow \text{ (mgd)} \times \text{average } TSS \text{ (mg./L)} \times 8.34^1 = \text{Background, } TSS \text{ (lbs./day)}$$

TABLE 3 CALCULATION OF BACKGROUND VALUE

| Flow (cfs) | Flow (mgd) | TSS (mg/L) | Background, TSS (lbs./day) |
|-------------------|------------|------------------|----------------------------|
| 11.0 ² | 7.2 | 5.9 ³ | 354 |

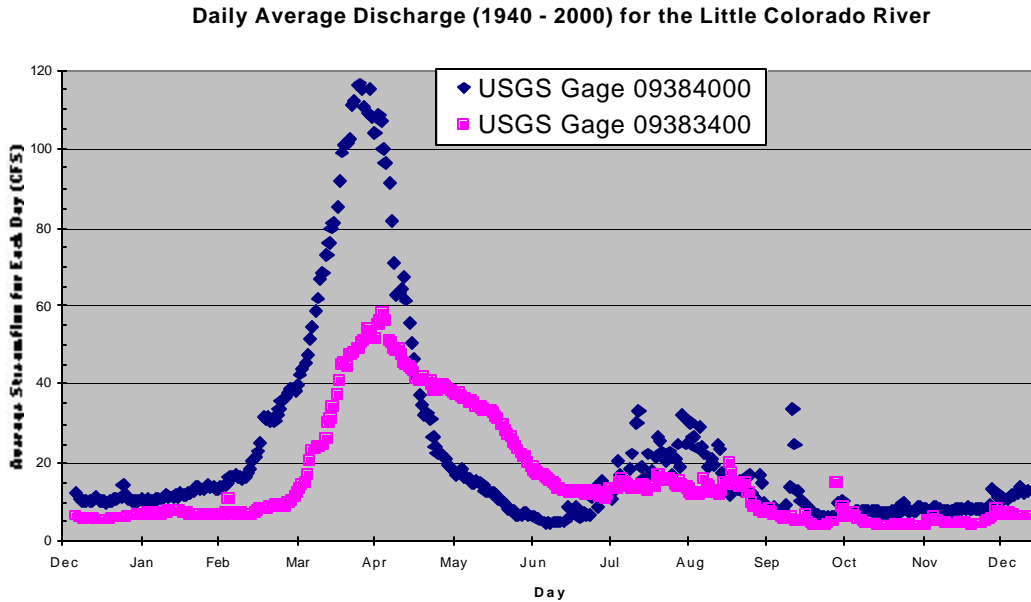
- 1 8.34 is a conversion factor to transform mg/L to lbs./day, the units are (lbs.)(L)/(mg)(10⁶ gallons)
- 2 Average flow values taken from USGS Gage Station 09384000, from 1940-2000
- 3 Calculated value based on turbidity samples

2.3.3 Consideration of Seasonal Variation

The LCR experiences three distinct flow regimes (Fig. 9): a Winter-Spring snowmelt and rain season, a Summer-Fall monsoon storm season, and the base flow conditions that occur at other times of the year. For this report data was sorted into two categories, Winter-Spring season, and Summer-Fall season. The Winter-Spring data has higher overall flows, a larger contributing sediment load, and is more sustained over the duration of the season. The Summer-Fall monsoon storm driven flows are highly variable dependent on location and storm intensity.

To take into consideration this discharge variation, and address the differences in the correlations between TSS and turbidity and flow, the TMDL values were calculated for each season. The average flow values were used to calculate a corresponding turbidity and TSS reading by utilizing the TSS and Turbidity vs. Discharge graphs (Figs. 6 and 8) and the TSS vs. Turbidity graphs (Figs. 5 and 7).

Figure 9



2.3.4 Margin of Safety

The MOS for this TMDL is different for the two seasons due to uncertainty in the correlations and regression analysis. For the Winter-Spring season, where a relatively sound regression was created between TSS and turbidity, and TSS and discharge, the MOS was set to be 10% of the LA value. For the Summer-Fall season, where a relatively sound regression was created between TSS and turbidity, but a large amount of scatter created an unreliable relationship between TSS and discharge, the MOS was set to be 25% of the LA value. These explicit MOS values account for errors in calculating the critical and average flows, the innate errors present in the correlation of TSS and turbidity with discharge, the possible error in the estimate of natural background values, and for the accuracy of the measurements and instruments.

2.3.5 Winter-Spring Flow Based TMDL Values

The following TMDL calculations are based upon the average Winter-Spring flow value of 28.9 cfs, which is based on 60 years of available data from the USGS gage station above Lyman Lake.

Calculation of Target Load Capacity (lbs₁ of TSS per day) for Winter-Spring Flows
 $Flow \text{ (mgd)} \times TSS \text{ target (mg/L)} \times 8.34 = \text{Target Load Capacity, TSS (lbs./day)}$

| Table 4 Calculation of Target Load for Winter-Spring Flows | | | | |
|--|------------|----------------------|-------------------|-----------------------------|
| Flow (cfs) | Flow (mgd) | Turbidity Std. (NTU) | TSS target (mg/L) | Target Load, TSS (lbs./day) |
| 28.9 ² | 18.9 | 10.0 ³ | 10.8 ⁴ | 1702 |

- 1 8.34 is a conversion factor to transform mg/L to lbs./day, the units are (lbs.)(L)/(mg)(10⁶ gallons)
- 2 Average flow values during the Winter-Spring flows (Nov 1 – May 31), data appeared in Graph 1; average discharge from 1940-2000
- 3 Arizona Aquatic and Wildlife cold-water stream surface WQS for turbidity is 10 NTU
- 4 Calculated using Equation 1, Winter – Spring TSS vs. Turbidity, and inputting the turbidity value of 10 NTU

Calculation of Little Colorado River TMDL for Winter-Spring Flows
 TMDL as TSS (lbs./day) = WLA + LA + BG + MOS
 MOS + LA = TMDL — WLA—BG, but, $MOS = 0.10(LA)$
 $0.10(LA) + 1(LA) = TMDL — WLA—BG$
 $LA = (TMDL — WLA—BG)/(1.10)$

| Table 5 Calculation of TMDL for Winter-Spring Flows | | | | |
|---|---------------|-----------------------|---------------------|-----------------|
| WLA (lbs./day) | LA (lbs./day) | Background (lbs./day) | MOS, 10% (lbs./day) | TMDL (lbs./day) |
| 0 | 1225 | 354 ¹ | 123 ² | 1702 |

- 1 This value was calculated earlier in section 2.3.2
- 2 MOS is 10% of the LA to accommodate for errors in data, graphical interpretations, and calculations of values

Calculation of the Measured** Load for Winter-Spring Flows
 $Flow (mgd) \times Measured^{**} TSS (mg/L) \times 8.34^1 = Measured^{**} Load, TSS (lbs./day)$

| Table 6 Calculation of Measured** Loads for Winter-Spring Flows | | | | |
|---|------------|----------------------------|-----------------------|---------------------------------|
| Flow (cfs) | Flow (mgd) | Measured** Turbidity (NTU) | Measured** TSS (mg/L) | Measured** Load, TSS (lbs./day) |
| 28.9 ² | 18.9 | 27.8 ³ | 44.2 ⁴ | 6959 |

- ** The term "Measured" refers to average Winter – Spring high flow values which were estimated using the correlation graphs, and aren't representative of actual field measurements.
- 1 8.34 is a conversion factor to transform mg/L to lbs./day, the units are (lbs.)(L)/(mg)(10⁶ gallons)
- 2 Average flow values during Winter-Spring flows as identified in graph 1
- 3 Calculated using Equation 1, TSS vs. Turbidity, and inputting the TSS value 44.2 mg/L
- 4 Calculated using Equation 2, Winter – Spring Discharge vs. Turbidity & TSS, and inputting a flow of 28.9 cfs

Calculation of TSS Load Reduction (lbs. per day) for Winter-spring flows
 $Measured^{**} Load, TSS - Target Load, TSS = Load Reduction, TSS (lbs./day)$

| Table 7 Calculation of Load Reductions for Winter-Spring Flows | | |
|--|--|---|
| <i>Measured** Load, TSS (lbs./day)</i> | <i>Target Load, TSS (lbs./day)</i> | <i>Load Reduction, TSS (lbs./day)</i> |
| 6,959 | 1,702 | 5,257 |

** The term "Measured" refers to average Winter – Spring high flow values which were estimated using the correlation graphs and aren't representative of actual field measurements.

2.3.6 Summer-Fall Flow Based TMDL Values

The following TMDL calculations are based upon the average Summer-Fall flow value of 13.1 cfs. Recalculation of the TMDL values using the average flow value of 13.1 cfs also requires the use of the corresponding Summer – Fall correlations and equations.

Calculation of Target TSS Load, adjusted for Summer-Fall Flows
 $Flow \text{ (mgd)} \times TSS \text{ target (mg/L)} \times 8.34^1 = \text{Target Load Capacity, TSS (lbs./day)}$

| Table 8 Calculation of Target Load for Summer-Fall Flows | | | | |
|--|-------------------|----------------------|--------------------------|------------------------------------|
| Flow (cfs) | <i>Flow (mgd)</i> | Turbidity Std. (NTU) | <i>TSS target (mg/L)</i> | <i>Target Load, TSS (lbs./day)</i> |
| 13.1 ² | 8.5 | 10.0 ³ | 9.6 ⁴ | 681 |

- 1 8.34 is a conversion factor to transform mg/L to lbs./day, the units are (lbs.)(L)/(mg)(10⁶ gallons)
- 2 Average flow values during the Summer-Fall flows (June 1 – Oct 31), data appeared in Graph 1; average discharge from 1940-2000
- 3 Arizona Aquatic and Wildlife cold-water stream surface WQS for turbidity is 10 NTU
- 4 Calculated using Equation 3, Summer – Fall, TSS vs. Turbidity, and inputting the turbidity value of 10 NTU

Calculation of TMDL during Summer-Fall Flow conditions
 $TMDL \text{ as TSS (lbs./day)} = WLA + LA + BG + MOS$
 $MOS + LA = TMDL - WLA - BG \text{ but, } MOS = 0.25LA$
 $0.25(LA) + 1(LA) = TMDL - WLA - BG$
 $LA = (TMDL - WLA - BG) / (1.25)$

| Table 9 Calculation of TMDL for Summer-Fall Flows | | | | |
|---|----------------------|------------------------------|---------------------|------------------------|
| <i>WLA (lbs./day)</i> | <i>LA (lbs./day)</i> | <i>Background (lbs./day)</i> | MOS, 25% (lbs./day) | <i>TMDL (lbs./day)</i> |
| 0 | 262 | 354 ¹ | 65 ² | 681 |

- 1 This value was calculated earlier in section 2.3.2.
- 2 MOS is 25% of the LA to accommodate for errors in data, graphical interpretations, regressions, and calculations of values

Calculation of the Measured** Load for Summer-Fall Flow conditions
 $Flow \text{ (mgd)} \times Measured^{**} TSS \text{ (mg/L)} \times 8.34^1 = Measured^{**} Load, TSS \text{ (lbs./day)}$

| Table 10 Calculation of Measured** Loads for Summer-Fall Flows | | | | |
|--|-------------------|----------------------------|------------------------------|--|
| Flow (cfs) | <i>Flow (mgd)</i> | Measured** Turbidity (NTU) | <i>Measured** TSS (mg/L)</i> | <i>Measured** Load, TSS (lbs./day)</i> |
| 13.1 ² | 8.5 | 36.7 ³ | 35.4 ⁴ | 2509 |

** The term "Measured" refers to average Summer-Fall high flow values which were estimated using the correlation graphs, and aren't representative of actual field measurements.

1 8.34 is a conversion factor to transform mg/L to lbs./day, the units are (lbs.)(L)/(mg)(10⁶ gallons)

2 Average flow values during Summer-Fall flows as identified in graph 1

3 Calculated using Equation 3, Summer – Fall, TSS vs. Turbidity, and inputting the TSS value 35.4 mg/L

4 Calculated using Equation 4, Summer – Fall, Discharge vs. Turbidity & TSS, and inputting the avg. Summer – Fall flow of 13.1 cfs

Calculation of Load Reductions for Summer-Fall Flow conditions
 $Measured^{**} Load, TSS - Target Load, TSS = Load Reduction, TSS \text{ (lbs./day)}$

| Table 11 Calculation of Load Reductions for Summer-Fall Flows | | |
|---|------------------------------------|---------------------------------------|
| <i>Measured** Load, TSS (lbs./day)</i> | <i>Target Load, TSS (lbs./day)</i> | <i>Load Reduction, TSS (lbs./day)</i> |
| 2,509 | 681 | 1828 |

** The term "Measured" refers to average Summer-Fall high flow values which were estimated using the correlation graphs, and aren't representative of actual field measurements.

2.4 Waste Load Allocations

No point sources for turbidity were found to be present on the LCR during ADEQ's sampling efforts and investigations. There have been no National Pollutant Discharge Elimination System (NPDES) permits issued for this section of the river system. Therefore, the WLA for all TMDL calculations is zero.

2.5 Load Allocations

Comparison of the different seasons indicates that the Winter-Spring season is responsible for more sediment delivery to the LCR than the Summer-Fall flows. LAs were based on the Winter-Spring TMDL values and subdivided by potential source. The potential sources were grouped into categories, based on field observations, to allow for smaller allocations. This will make it possible to set goals and judge the effectiveness of implementation plans. The values are presented in the following table.

| Table 12 Load Allocations and Load Reduction Targets by Source | | | | | |
|--|--|---------------------------|------------------------------|-------------------------------|---|
| Type of potential source | Percent contributing to the TMDL Load Allocation | Load value (lbs./day TSS) | Percent Reduction in Loading | Load Reduction (lbs./day TSS) | Percent of total load reduction necessary as per the TMDL |
| Grazing Practices | 60 | 4,175 | 75 | 3,132 | 60 |
| Stream Channel Instabilities | 15 | 1,044 | 65 | 679 | 13 |
| Road Cuts | 5 | 348 | 55 | 191 | 4 |
| Golf Course | 5 | 348 | 85 | 296 | 6 |
| Streambed Load | 5 | 348 | 55 | 191 | 4 |
| Natural Conditions | 10 | 696 | 0 | 0 | 0 |
| TOTAL | 100% (6,959) | 6,959 | N/A | 4,420 | 85% (5,257) |

The overall load reduction needed to comply with current Arizona WQSs is approximately 5,257 lbs./day of sediment during the critical Winter-Spring flows. However, the recently completed and approved Nutrioso Creek TMDL for turbidity contains an implementation plan that targets an overall reduction of approximately 837 lbs./day of sediment during the critical Spring flow. As Nutrioso Creek is tributary to the LCR, this load reduction was subtracted from the needed reduction in the LCR to 4,420 lbs./day.

3 IMPLEMENTATION

By focusing most of the implementation on the larger values obtained from the Winter-Spring relationships, it can be assured that compliance with the TMDL will lead to the LCR meeting and maintaining Arizona's surface WQSs for turbidity. Private landowners as well as state and federal land managers can apply for grants and seek assistance in securing finances and technical expertise in meeting and maintaining the goals set forth in this report. Possible TMDL implementation strategies include the following:

1. Increase education and public awareness to local landowners through outreach and watershed group activities
2. Create milestones for each BMP and project and evaluate effectiveness as necessary
3. Decrease stream velocities during critical flow events by:
 - a) Increasing willow vegetation
 - b) Placing stream grade stabilization structures
 - c) Increasing the flood plain (i.e. adding point bars)
4. Decrease sheet flow and wind erosion contributions to tributaries and listed segments of the LCR by:
 - a) Removing rabbitbrush
 - b) Increasing density of grasses as land cover
5. Prevent stream channel down cutting and promote stabilization by:
 - a) Removing cattle and wildlife from the stream channel during critical flow periods
 - b) Allowing cattle to graze only in the dormant winter months, under a range management system
 - c) Re-vegetating the stream channel
 - d) Using stream restoration techniques to speed up recovery of stream corridor

3.1 Best Management Practices

A variety of BMPs can be utilized as part of the implementation strategy to reduce sediment loading to the LCR.

Cattle grazing in the riparian corridor could be confined to only the dormant winter months, which would allow the emergent plants in the spring to grow and take hold. It would also allow for a greater diversity of plant communities in the riparian corridor, which will help establish more protective cover for the erosive soils and act as stream energy dissipaters during higher flows. The BLM recommends winter grazing because the cattle's hoof action compacts soils and adds in nutrients. Also, the cattle will feed on the mature old growth allowing room in the spring for the new growth to occur and compete for resources (BLM,1989). The USFS recommends that winter grazing maintain adequate stubble height of the vegetation going into the spring growing season (ADEQ, 2000).

The USFS Apache-Sitgreaves is a primary landowner in the project area. They are committed to improving the land resources within their jurisdiction and have several

projects ongoing within the watershed (ADEQ, 2000). Some of these projects include: reduced logging, road closures, and revisions in grazing allotments.

The Apache-Sitgreaves National Forest has already implemented, or plans to implement, a variety of BMPs on lands under their jurisdiction including: 1) reduced logging; 2) road closures – 40 miles of roads were closed as an erosional control measure in 1999; and 3) the forest instituted the following grazing allotment revisions:

- Adjusted cattle entry times and densities
- Since 1995, they have had a 66% reduction in cattle numbers on the Alpine District
- A goal to balance the permitted numbers with the allowable use by 2005 in all Apache-Sitgreaves National Forest Grazing Allotments

The management of ungulate wildlife populations is the jurisdiction of AGFD. For Game Management Unit (GMU) 1, in which this portion of the LCR watershed is located, elk population numbers have declined approximately 42% since 1994. The AGFD has implemented a monitoring program to assess herbaceous forage utilization by elk in key areas in all GMUs within Region I. This information enables the Department to incorporate habitat-based parameters into annual population management objectives for elk. The monitoring data indicated high utilization in localized areas of the LCR by elk. To address utilization concerns, the AGFD has proactively implemented management strategies during the last several years with the objective of reducing the elk population in GMU 1. As noted above, these strategies have resulted in substantial reductions since the mid-1990's. The success of these strategies is dependent on a variety of factors including habitat condition and available forage. The AGFD actively manages ungulate wildlife populations within the watershed. The AGFD monitors herbaceous forage usage of elk, the primary wildlife ungulate, to assist in population management strategies. Active management strategies enacted over the last several years have resulted in an approximate 42% reduction in the number of elk (AGFD, 2002).

The large sector of private lands also needs to be addressed. Additional projects and BMPs for use on private lands will be important in the future.

Several implementation practices and projects have been undertaken on Nutrioso Creek, a tributary to the LCR, that could be beneficial if applied to other areas within the LCR listed reach. Some of these projects include:

- In areas where historic overgrazing has occurred, private landowners have fenced off the riparian corridor to keep out cattle and elk during critical growing periods.

- Stream grade stabilization structures have been installed to help protect the at risk banks during high critical flow events. These structures will also help dissipate stream velocities and thus dissipate stream energy and erosional forces during high flows (ADEQ, 2000).
- Stream restoration projects have been undertaken to speed up the development of an in-channel flood plain, increase sinuosity, etc. It is important to note, while these projects have created a more immediate impact on improving water quality during critical flow, they are more costly and severe to implement.
- Off channel water wells and wildlife drinkers have allowed for more water to remain in the stream itself and allow for the riparian corridor to be fenced off without water-gaps for wildlife and cattle to access the stream for drinking purposes. This has allowed for irrigation of the re-vegetation projects along the stream corridor. However, caution should be used in the placement of these structures. While reducing water withdrawals from stream channels is commendable goal, a shift to groundwater use, if it results in an overall increase in water use, could result in a lowered water table, which could in turn negatively affect in-stream flows (AGFD, 2002).
- The riparian corridor has been re-vegetated with willow plantings and grass seeds using a Critical Area Planting method as outlined by the Natural Resources Conservation Service. These plantings have been supplemented with sprinkler irrigated waters until they took hold on the established banks and stream course. The plantings on the upland areas beyond the stream corridor were sprinkler irrigated until the root were established enough to reach the moisture in the soils. These plantings have helped protect the erosive soils and act to dissipate stream energy during critical flow (ADEQ, 2000).
- Sprinkler irrigation systems combined with a poly pipe to line the irrigation ditch have increased irrigation efficiencies and allowed for more water to stay in the stream and thus increase the streamflow year round. Combined with other projects and aspects of implementation these tools have allowed for effective revegetation and removal of cattle and wildlife from the stream course for the majority of the year by creating more forage in the managed rangeland and an alternative water source created from the groundwater wells.
- Rabbitbrush eradication projects have been undertaken on some properties. By removing the rabbitbrush and replacing it with grass seeding, more grass per acre has been created for cattle consumption, reducing their reliance on the riparian vegetation of the stream corridor and

allowing for their removal from the riparian corridor with the use of fences and range management plans. From a watershed standpoint the removal of rabbitbrush and reintroduction of grasses improves species diversity and composition. Also, the grasses provide a more stable root mass than the rabbitbrush, thus increasing the soil stability of the rangelands and decreasing the amount of sediment contributed from sheet flow and wind erosion over these rangelands.

3.2 MONITORING PLAN

ADEQ staff will continue to monitor turbidity, TSS, flow, and stream morphology over the next several years during varied flow stages. The LCR watershed is scheduled for more intensive ambient monitoring as a part of the Fixed Station Network (FSN) rotating watershed approach in 2006. This approach targets two watersheds each year over a five year period. ADEQ will monitor water quality and physical integrity of the LCR using techniques such as :

- Historic photo monitoring sites that are present, which can be utilized for future comparisons.
- Aerial photography to monitor vegetative cover.
- Stream channel cross sections to assess changes in channel morphology.
- Permanent follow-up monitoring sites to perform trend analyses.

Macroinvertebrate sampling may also be undertaken in order to obtain the necessary information to calculate an Index of Biological Integrity score. This information will allow for a more direct measure of the health of the LCR aquatic ecosystem. This data will augment the turbidity and TSS data as it is a more direct measure of stream health for water designated as Aquatic and Wildlife cold (A&Wc). This data will also allow for the re-evaluation of the implementation strategies, milestones, and goals.

Potential volunteer monitoring of native threatened and endangered aquatic species and the displacement, or die-off, of introduced aquatic species would contribute valuable data. This could help to guide implementation, future BMPs, and the re-evaluation of this TMDL and the milestones set forth. Volunteer monitoring of discharge, turbidity, and TSS, along with erosional and sedimentation features, could be of assistance in the future for re-evaluation and assessment of the goals and values set forth, as well as to track progress of the implementation plan.

3.3 Time Line

The LCR TMDL will use a phased approach to TMDL implementation. Watershed projects will be started incrementally as they are funded. The time frame for implementation is estimated to be 10 years (Table 13). Therefore the timeframe estimated

for the LCR to meet the turbidity standard during critical flows is approximately 15 - 30 years, depending upon the amount and the duration of flow events in the LCR. The USEPA recognizes that sediment TMDLs with primarily non-point sources of pollution can be difficult to manage, and that these problems are often generated over multiple generations and may require as long to correct (USEPA, 1999).

Table 13 Estimated Implementation Schedule

| ACTIVITY | YEAR | | | | | | | | | |
|--------------------------------------|------|---|---|---|---|---|---|---|---|----|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Public outreach & involvement | X | X | X | X | X | X | X | X | X | X |
| Establish Milestones | X | | | | X | | | | | X |
| Secure project funding, as needed | X | X | X | X | X | X | X | X | X | X |
| Best Management Practices | X | X | X | X | X | X | X | X | X | X |
| Determine BMPs effectiveness | | | X | | X | | | | | X |
| Reevaluate Milestones and strategies | | | | | X | | | | | X |

3.4 Milestones

Milestones will be used to determine if control measures and BMPs are having a positive impact on reducing turbidity and the erosional forces present in the LCR. Various measures will be utilized as milestones to measure the success of the projects and the BMPs. This could include an increased amount of natural vegetation in the stream course, a more stable channel geometry, lowered stream velocities, lower TSS and turbidity values during higher discharges, and more balanced TSS and turbidity values during different flow regimes. The milestones will be reevaluated periodically to determine their validity and effectiveness as more data is available for analysis.

3.5 Assurances

Arizona Revised Statutes do not provide for enforceable actions to be taken against non-point sources of pollution. Implementation plans for nonpoint source TMDLs depend solely upon the volunteer approach of land managers, in implementing projects and BMPs. Cooperation of State and Federal Agencies and private landowners will be paramount in the implementation of this TMDL. ADEQ has grant funding available, as do other agencies, to help with the implementation of watershed restoration strategies.

4 PUBLIC PARTICIPATION

4.1 Public Participation in the TMDL Process

Public participation occurred during data collection, background information, and in developing this report. In March 2002, the draft TMDL was made available for a 30-day public comment period. Public notice of the availability of the draft document was posted in a newspaper of general circulation (*The White Mountain Independent*), email notifications, phone calls, and webpage postings. The LCR TMDL Draft was presented to the Upper Little Colorado River Watershed Group in their March 28, 2002 meeting.

No comments were received during the public notice. This TMDL was published in the Arizona Administrative Register in May, 2002, in compliance with A.R.S. §49-231. After the 45-day notice period has been completed, the TMDL will be forwarded to EPA for approval.

4.2 Watershed Group

The LCR Watershed Partnership was formed in November of 1998. The LCR Watershed Partnership incorporates concerned private citizens, private landowners, and other interested State and Federal Agency personnel. The watershed group will provide oversight for the implementation projects and plans, and may provide additional data in the form of volunteer monitoring of the stream.

ADEQ has a website at <http://www.adeq.state.az.us/environ/water/assess> that will provide information and links to other data relevant to this LCR TMDL and contact information.

REFERENCES

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- Arizona State University. Department of Geology web page, http://geology.asu.edu/volc/az_volcs.
- Bureau of Land Management. Grazing Management for Riparian-Wetlands Areas. TR 1737-11 1989.
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- Reynolds, Stephen J. Geologic Map of Arizona. 1988.
- Snyder, Bruce and Snyder, Janet. Engineering-Science, Inc. for ADEQ contract # 343280S25. Analysis of Water Quality Functions of Riparian Vegetation. Oct. 1994.
- USEPA. Protocol for Developing Sediment TMDL's, 1st Edition. EPA 841-B-99-004 October 1999.

APPENDIX A

| STATION NUMBER | DATE | TURBIDITY VALUE (NTU) | AVG. TURB. (NTU) | FLOW(CFS) | TSS(MG/L) |
|----------------|------------|-----------------------|------------------|-----------|-----------|
| 100329 | 08/21/90 | 1 | 1 | 1.74 | 5 |
| | 10/19/90 | 0.8 | 0.8 | 2.46 | 4 |
| | 06/19/91 | 1.32 | 1.32 | 23.52 | 6 |
| | 08/07/91 | 1.38 | 1.38 | 4.6 | 5 |
| | 10/09/91 | 0.49, 0.46 | 0.48 | 2.89 | 4 |
| | 01/06/92 | 0.58 | 0.58 | 6.5 | 4 |
| | 04/15/92 | 8.30, 10.00 | 9.15 | 6 | 4 |
| | 06/10/92 | 2.10, 2.50 | 2.3 | 20.76 | 7 |
| | 08/11/92 | 2.20, 1.05 | 1.63 | 6.15 | 10 |
| | 10/18/94 | 0.79, 1.07 | 0.93 | 4.2 | 4 |
| | 12/13/94 | 0.16, 0.16 | 0.16, 0.16 | 6 | 4 |
| | 04/18/95 | 2.70, 3.48 | 3.09 | 8.9 | 9 |
| | 06/07/95 | 1.50, 4.48 | 2.99 | 37.62 | 12 |
| | 08/29/95 | 3.3 | 3.3 | | |
| 100328 | 11/11/87 | 1.55 | 1.55 | 8.42 | 5 |
| | 01/13/88 | 0.71 | 0.71 | 5.54 | 2 |
| | 02/17/88 | 3.8 | 3.8 | 5.77 | 2 |
| | 04/12/88 | 3.9 | 3.9 | 17.79 | 5 |
| | 06/22/88 | 0.96 | 0.96 | 12.13 | 8 |
| | 09/14/88 | 1.9 | 1.9 | 13.2 | 5 |
| | 10/18/88 | 0.9 | 0.9 | 6.1 | 14 |
| | 11/08/88 | 0.8 | 0.8 | 5.7 | 4 |
| | 12/13/88 | 1.1 | 1.1 | 5.3 | 2 |
| | 01/09/89 | 1.4 | 1.4 | 5.7 | 8 |
| | 02/15/89 | 0.71 | 0.71 | 3.9 | 2 |
| | 04/10/89 | 4.2 | 4.2 | 12.9 | 26 |
| | 05/08/89 | 2.5 | 2.5 | 11.6 | 4 |
| | 06/06/89 | 0.4 | 0.4 | 5.1 | 2 |
| | 07/10/89 | 0.83 | 0.83 | 3.9 | 10 |
| | 07/31/89 | 1.7 | 1.7 | 5.6 | 4 |
| | 09/14/89 | 0.9 | 0.9 | 7.9 | 4 |
| | 10/26/93 | 0.65, 1.2 | 0.93 | 6.62 | 4 |
| | 12/15/93 | 1.1, 1.68 | 1.4 | 5.78 | 4 |
| | 02/10/94 | 0.97, 1.38 | 1.18 | 5.27 | 4 |
| 04/13/94 | 1.39, 1.87 | 1.63 | 7.74 | 4 | |
| 06/14/94 | 1.2, 2.1 | 1.7 | 9.81 | 4 | |

| STATION NUMBER | DATE | TURBIDITY VALUE (NTU) | AVG. TURB. (NTU) | FLOW(CFS) | TSS(MG/L) |
|----------------|----------|-----------------------|------------------|-----------|-----------|
| 100328 CONT | 08/16/94 | 1.23, 1.88 | 1.56 | 6.16 | 4 |
| | 10/18/94 | 0.78, 1.6 | 1.19 | 5.16 | 4 |
| | 12/13/94 | 0.23, 2.2 | 1.22 | 6.27 | 4 |
| | 02/22/95 | 2.9, 5.13 | 4 | 7.31 | 9 |
| | 04/18/95 | 3.2, 3.74 | 3.5 | 22.1 | 7 |
| | 06/06/95 | 2.1, 4.62 | 3.4 | 41.33 | 10 |
| | 08/28/95 | 1.33, 3.41 | 2.37 | 17.08 | 5 |
| | 10/30/95 | 0.63, 1.94 | 1.29 | 5.48 | 4 |
| | 12/27/95 | 0.79, 3.47 | 2.13 | 5.53 | 4 |
| | 02/22/96 | 0.93, 1.41 | 1.17 | 4.88 | 4 |
| | 04/26/96 | 0.47, 3.20 | 1.84 | 5.53 | 4 |
| | 06/18/96 | 0.86, 1.25 | 1.06 | 2.5 | 4 |
| | 08/28/96 | 1.21, 1.19 | 1.2 | 4.88 | 7 |
| | 04/13/99 | 6.97, 3.10 | 5.04 | 6.94 | |
| | 06/22/99 | 0.71, 1.54 | 1.13 | 4.64 | |
| | 08/24/99 | 2.13, 1.00 | 1.57 | 14.35 | |
| | 10/14/99 | 1.36, 0.97 | 1.17 | 5.28 | 4 |
| | 03/30/00 | 2.00, 2.60 | 2.3 | 5.67 | |
| | 06/28/00 | 5.40, 2.70 | 4.05 | 5.53 | 10 |
| | 0 | 06/20/00 | 11, 13.4 | 12.2 | |
| 08/01/00 | | 12.2, 12.4 | 12.3 | 0.31 | 20 |
| 09/27/00 | | 5.52, 5.63 | 5.75 | 0.52 | 13 |
| 10/24/00 | | 4.56, 3.48 | 4.02 | 0.85 | 10 |
| 10 | 06/20/00 | 3.24, 3.99 | 3.62 | | |
| | 08/01/00 | 3.89, 6.04 | 4.97 | | |
| | 09/27/00 | 7.9, 6.75 | 7.33 | | 16 |
| | 10/24/00 | 8.11, 7.9 | 8.01 | | 6 |
| 100644 | 07/08/92 | 0.6, 0.4 | 0.5 | 5 | |
| | 06/16/93 | 0.8, 1.5, 0.6 | 1 | | |
| | 06/08/95 | 1.7 | 1.7 | 0.3 | |
| | 06/02/98 | 0.94, 0.95 | 0.9 | | |
| 20 | 06/20/00 | 1.27, 1.32 | 1.3 | | |
| | 08/01/00 | 1.04, 1.41 | 1.23 | | |
| | 09/27/00 | 0.32, 0.65 | 0.49 | 1.43 | 8 |
| | 10/24/00 | 2.77, 2.71 | 2.74 | 0.83 | |
| 22 | 06/20/00 | 3.23, 2.88 | 3.06 | | |
| | 08/01/00 | 2.64, 2.09 | 2.37 | | |

| STATION NUMBER | DATE | TURBIDITY VALUE (NTU) | AVG. TURB. (NTU) | FLOW(CFS) | TSS(MG/L) |
|----------------|----------|------------------------|------------------|-----------|-----------|
| 22 CONT | 09/27/00 | 1.99, 1.94 | 1.97 | | 9 |
| | 10/24/00 | 2.08, 2.48 | 2.28 | | 8 |
| 30 | 06/20/00 | 7.05, 6.42 | 6.61 | | |
| | 06/21/00 | 5.91, 5.73 | | 8.31 | 6 |
| | 06/23/00 | 6.46, 6.76 | | 8.3 | 6 |
| | 08/01/00 | 7.35, 6.72 | 7.04 | 4.66 | 4 |
| | 09/27/00 | 5.96, 5.76 | 5.86 | 2.01 | 10 |
| | 09/28/00 | 8.37, 8.24 | 8.31 | | |
| | 10/24/00 | 7.52, 7.7 | 7.61 | 5.45 | 18 |
| 35 | 06/20/00 | 12.1, 12 | 12.05 | | |
| | 08/01/00 | 24.3, 24.2 | 24.3 | | 17 |
| | 09/27/00 | 33, 31.8 | 32.4 | | 36 |
| | 10/24/00 | 24, 24.2 | 24.1 | | 27 |
| 40 | 06/20/00 | 27.4, 27.9 | 27.7 | | |
| | 08/01/00 | 30.4, 32.3, 33.2, 29.4 | 31.3 | 4.24 | 30 |
| | 09/27/00 | 23.6, 22.9 | 23.25 | 0.73 | 21 |
| | 10/24/00 | 31.5, 31.7 | 31.6 | 7.22 | 32 |
| 52 | 06/23/00 | 14.2, 13.2 | 13.7 | 9.34 | 24 |
| | 06/21/00 | 18.6, 18.5 | 18.6 | 6.89 | 5 |
| | 08/01/00 | 29.4, 27.9 | 28.7 | 3.78 | 23 |
| | 09/27/00 | 14.7, 13.7 | 14.2 | 1.53 | 14 |
| | 10/24/00 | 27.3, 26.4 | 26.85 | | 21 |
| 70 | 06/21/00 | 17.9, 17.8 | 17.9 | | |
| | 08/03/00 | 38, 36.2 | 37.1 | | |
| | 09/27/00 | 15, 15.7 | 15.35 | | |
| | 10/24/00 | 29.3, 27.8 | 28.55 | | 34 |
| 76 | 06/21/00 | 14.5, 14.3 | 14.4 | | |
| | 08/03/00 | 34.9, 34.7 | 34.8 | | |
| | 09/27/00 | 15.1, 15.1 | 15.1 | | |
| | 10/24/00 | 29.8, 29 | 29.4 | | 33 |
| 78 | 06/21/00 | 14, 14.7 | 14.4 | | |
| | 08/03/00 | 33.9, 32.8 | 33.4 | | |
| | 9/27/00 | 14.4, 14.8 | 14.6 | | 24 |
| | 10/24/00 | 28.6, 29.1 | 28.85 | | 47 |
| 80 | 06/21/00 | 28, 27.5 | 27.8 | | |
| | 08/02/00 | 31.9, 30.5 | 31.2 | | |
| | 09/27/00 | 16.4, 16.8 | 16.6 | | 12 |

| STATION NUMBER | DATE | TURBIDITY VALUE (NTU) | AVG. TURB. (NTU) | FLOW(CFS) | TSS(MG/L) |
|----------------|----------|-----------------------|------------------|-----------|-----------|
| 80 CONT | 09/28/00 | 23, 22.6 | 22.8 | | |
| | 10/25/00 | 26.6, 26.3 | 26.45 | | 25 |
| 90 | 06/21/00 | 25.5, 24.4 | 25 | 2.31 | 26 |
| | 06/23/00 | 21.2, 24.7 | 23 | | |
| | 08/02/00 | 39.9, 39.4 | 39.7 | 1.44 | 38 |
| | 09/27/00 | 31.6, 31.4 | 31.5 | 0.84 | 47 |
| | 10/24/00 | 46.1, 46.7 | 46.4 | | 50 |
| 100333 | 10/26/93 | 6, 12.3, 6.3 | 8.2 | 4.94 | 8 |
| | 12/15/93 | 7, 7.06 | 7.03 | 1.78 | 4 |
| | 02/10/94 | 5.5, 8.47 | 7 | 2.98 | 6 |
| | 04/14/94 | 11.2, 12.7 | 12 | 15.07 | 14 |
| | 06/02/94 | 8.7 | 8.7 | 2.66 | 15 |
| | 06/14/94 | 8.6, 11.3 | 10 | 2.58 | 9 |
| | 10/18/94 | 7.4, 9.99 | 8.7 | 7.15 | 5 |
| | 12/13/94 | 3.5, 13.7 | 8.6 | 6.49 | 10 |
| | 02/22/95 | 11.2, 15.6 | 13.4 | 13.99 | 11 |
| | 04/18/95 | 7.2, 7.83 | 7.5 | 28.93 | 11 |
| | 06/06/95 | 8.7, 11.5 | 10.1 | 6.78 | 19 |
| | 08/29/95 | 53, 96.4 | 74.7 | 40.1 | 130 |
| | 10/30/95 | 9.4, 13.2 | 11.3 | 4.378 | 12 |
| | 12/27/95 | 6, 10 | 8 | 5.97 | 12 |
| | 02/22/96 | 11.3, 18.3 | 14.8 | 4.11 | 18 |
| | 04/24/96 | 12.2, 16.1 | 14.2 | 1.58 | 19 |
| | 06/20/96 | 7.3, 11.3 | 9.3 | 0.8 | 12 |
| 08/28/96 | 22, 38.3 | 30.15 | 4.55 | 53 | |
| 100331 | 06/19/91 | 6.6 | 6.6 | 14.19 | 7 |
| | 08/07/91 | 14.4 | 14.4 | 8.98 | 29 |
| | 12/03/91 | 3.9, 6.3 | 5.1 | 1.17 | 14 |
| | 10/09/91 | 9.4 | 9.4 | 0.25 | 16 |
| | 02/19/92 | 6.2 | | | |
| | 06/11/92 | 43 | 55 | 17.12 | 21 |
| | 08/11/92 | 12.5, 14 | 13.3 | 10.28 | 38 |
| | 11/24/92 | 16.4, 24.5 | 20.5 | 7.12 | 14 |
| | 03/16/93 | 46.5, 9.2 | 27.9 | 77.2 | 126 |
| | 06/23/93 | 14.6, 47 | 30.8 | 13.14 | 17 |
| | 04/13/99 | 7.9, 16.3 | 12.1 | 2.92 | 11 |
| | 06/22/99 | 12.2, 7.3 | 9.8 | 2.16 | 5 |

| STATION NUMBER | DATE | TURBIDITY VALUE (NTU) | AVG. TURB. (NTU) | FLOW(CFS) | TSS(MG/L) |
|----------------|----------|------------------------|------------------|-----------|-----------|
| 100331 CONT | 08/24/99 | 16.4, 10 | 13.2 | 36.72 | 16 |
| | 10/14/99 | 9.51, 5.2 | 7.4 | 5.5 | 7 |
| | 03/29/00 | 19, 22.6 | 20.8 | 14.53 | 40 |
| | 06/28/00 | 10.2, 6.7 | 8.5 | 1.35 | 8 |
| | 08/15/00 | 24, 44.5 | 34.3 | 2.18 | 42 |
| 100 | 06/21/00 | 9.96, 10.7 | 10.3 | | |
| | 08/02/00 | 40, 38.8 | 39.4 | 1.46 | 27 |
| | 09/28/00 | 34.8, 33.8 | 34.3 | 1.07 | 41 |
| | 10/24/00 | 79.7, 76.9 | 78.3 | 7.93 | 60 |
| 108 | 09/27/00 | 41, 41.7 | 41.35 | | |
| | 10/24/00 | 78, 74.3 | 76.15 | | 63 |
| 109 | 08/02/00 | 32.9, 33.1 | 33 | 1.45 | 27 |
| | 09/27/00 | 38.3, 39.1 | 38.7 | 0.63 | 29 |
| | 10/24/00 | 71.4, 71.4 | 71.4 | 8.11 | 66 |
| 110 | 06/21/00 | 35.8, 34.4 | 35.1 | | |
| | 09/27/00 | 51.3, 51.8, 56.7, 59.2 | 51.55, 57.95 | 0.56 | |
| | 10/24/00 | 76.2, 77.3 | 76.75 | | 65 |
| 120 | 08/02/00 | 36.9, 35.5 | 36.2 | 0.85 | 32 |
| | 09/28/00 | 45.6, 46.2 | 45.9 | 0.21 | 45 |
| | 10/24/00 | 86, 85.3 | 85.65 | 9.13 | 66 |
| 130 | 06/22/00 | 33.5, 33.6, 34.6, 34.6 | 34.1 | | |
| | 08/02/00 | 35.5, 33.5 | 34.5 | | |
| | 09/28/00 | 35.9, 36.2 | 36.05 | | |
| | 10/24/00 | 127, 128 | 127.5 | | 110 |
| 140 | 06/21/00 | 28.9, 29.3 | 29.1 | | |
| | 08/02/00 | 33.7, 32.6 | 33.2 | 1.16 | 32 |
| | 09/28/00 | 16.7, 16.5 | 16.6 | 0.88 | |
| | 09/28/00 | 26.9, 27.9 | 27.4 | | 15 |
| | 10/24/00 | 108, 101 | 104.5 | 10.25 | 91 |



**ARIZONA DEPARTMENT
OF
ENVIRONMENTAL QUALITY**



**NOTICE OF INTENT | AZPDES STORMWATER CONSTRUCTION
GENERAL PERMIT (CGP)**

LTF#: 89152

ID#: AZCN89152

Issued: 05/18/2021

Permit/Certificate Type: NOI

Expiration Date: 06/30/2025

Coverage Issued to:

Name: OXBOW ECOLOGICAL ENGINEERING, LLC

Address Line 1: 3491 S GILLENWATER DR

City: FLAGSTAFF

State: AZ

Zip: 86005

Construction Site Information:

Site Name: FY21 Becker Lake Wildlife Area

Location:

Lat: 34.143333 / Long: -109.293583

Acres Disturbed: 4.51

Outfall Location(s):

**SAMPLE POINT (MP1) | 34.139394 | -109.292536 | Little Colorado River |
Water Canyon Creek - NUTRIOSO CREEK @ 34°09'03.7"/109°17'37.2"**

**SAMPLE POINT (MP2) | 34.144406 | -109.294328 | Little Colorado River |
Water Canyon Creek - NUTRIOSO CREEK @ 34°09'03.7"/109°17'37.2"**

SAMPLE POINT (MP3) | 34.145797 | -109.294936 | Little Colorado River |

Water Canyon Creek - NUTRIOSO CREEK @ 34°09'03.7"/109°17'37.2"

Discharge Monitoring Report (DMR) Required: **Yes**

SWPPP Contact Information:

First Name: **George**

Last Name: **Cathey**

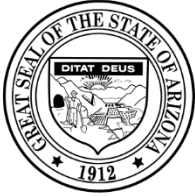
Phone: **9282666192**

Work Email: **george@oxbow-eco-eng.com**

Please note, that pursuant to Arizona Administrative Code, Title 18, Chapter 14, Article 109(C), you will be billed an annual permit fee equal to the initial fee until such time as you submit a Notice of Termination to close out your permit coverage.

You are authorized to operate under this Construction General Permit NOI. This authorization may be revoked in the event that you, the permittee, fails to comply with the general permit or has the potential to cause or contribute to the violation of a Surface Water Quality Standard.

If you have any questions regarding this Construction General Permit NOI, please contact the Stormwater Program at 602-771-4666.



Douglas A. Ducey
Governor

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY



Misael Cabrera
Director

July 27, 2020

David Dorum
Arizona Game and Fish Department
2728 E White Mountain Blvd.
Pinetop, AZ 85935

**Re: Clean Water Act § 401 Water Quality Certification for Becker Lake Wildlife Area –
Little Colorado River Habitat Improvement Project**

Dear Mr. Dorum:

The Arizona Department of Environmental Quality (ADEQ) received your § 401 application for aquatic habitat restoration in the Becker Lake Wildlife Area on July 16, 2020. ADEQ's review was conducted pursuant to Section 401(a) of the Federal Clean Water Act (CWA) (33 U.S.C. §1251 et seq.) and Arizona Revised Statutes Section 49-202, which specifies that ADEQ shall process requests by applicants for §401 certification of nationwide or general permits required by Section 404 of the CWA to determine whether the effect of a discharge will comply with the Arizona's surface water quality standards for navigable waters.

ADEQ has reviewed the information in the application and determined that this project is conditionally certified pursuant to the U.S. Army Corps of Engineers (USACE) Nationwide Permit #27 (NWP), Aquatic Habitat Restoration, Establishment, and Enhancement Activities..

Required Actions

- The applicant is responsible for complying with all general conditions specified in the State of Arizona's CWA § 401 Water Quality Certification of the USACE NWP #27.

Recommendations

The suggestions below are not required by State law and there are no legal consequences should you choose to disregard them; however, ADEQ appreciates your cooperation and asks you to consider the following:

Main Office

1110 W. Washington Street • Phoenix, AZ 85007
(602) 771-2300

Southern Regional Office

400 W. Congress Street • Suite 433 • Tucson, AZ 85701
(520) 628-6733

www.azdeq.gov

printed on recycled paper

- The issuance of a State § 401 Water Quality Conditional Certification does not imply or suggest that requirements for other permits including, but not limited to: Aquifer Protection Permits, Arizona Pollutant Discharge Elimination System Permits, Construction General Permits, DeMinimis Permits, Pesticide General Permits, and Reclaimed Water permits are met or superseded. Applicant should contact ADEQ to ensure all applicable permits are obtained.

Correspondence

For any correspondence regarding this project, the ADEQ mailing address is:

Arizona Department of Environmental Quality
Rosi Sherrill
Surface Water Section / § 401 Certifications
1110 West Washington Street
Phoenix, Arizona 85007

For questions or general comments:

Email: sherrill.laurie@azdeq.gov

Voice: (602) 771-4409

In any correspondence, please reference:

Becker Lake Wildlife Area
USACE File No.: SPL-2020-00300
ADEQ LTF No.: 83746

Thank you for your efforts to comply with Arizona's environmental requirements. Should you have any comments or questions regarding this matter, please do not hesitate to contact me.

Sincerely,

Rosi Sherrill

Laurie (Rosi) Sherrill
Surface Water Permits

electronic copies: Oxbow Ecological Engineering, LLC, Attn: George Cathey
Fred Phillips Consulting, Attn: Fred Phillips
U.S. Army Corps of Engineers, Regulatory Branch – Attn.: Ann Palaruan
USEPA, Wetlands Regulatory Office, Attn.: Elizabeth Goldmann

**ARIZONA GAME AND FISH DEPARTMENT
ENVIRONMENTAL ASSESSMENT CHECKLIST**

| | | | | | |
|--|--|--|--------------|------------|---------------------|
| PROJECT TITLE: <i>Becker Lake Wildlife Area - Little Colorado River Habitat Improvement Project</i> | | | | | |
| PROJECT COORDINATOR (Work Unit): David Dorum (FOR1) | | | | | |
| FUNDING TYPE: <input type="checkbox"/> WSFR (Federal Aid) <input type="checkbox"/> Federal (Other) <input checked="" type="checkbox"/> State <input type="checkbox"/> Other <input type="checkbox"/> No AGFD Funding Used <small>(right click to check box)</small> | | FUNDING SOURCE NAME(s) & INDEX #(s): Heritage – Index #13072 | | | |
| PROJECT START DATE: | | 3/23/2021 | | | |
| PROJECT END DATE: | | 3/23/2026 | | | |
| LANDOWNER(s): | | Az Game and Fish Commission | | | |
| COOPERATIVE PARTIES: | | N/A | | | |
| SITE NAME AND/OR LANDOWNER | | TOWNSHIP | RANGE | SEC | UTMs (NAD83) |
| Az Game and Fish Commission | | 9N | 29E | 29, 32 | |

BACKGROUND

The Becker Lake Wildlife Area (BLWA) is 635 acres of Arizona Game and Fish Commission deeded lands within the town limits of Springerville (Figures 1 and 2). AZGFD acquired Becker Lake itself and the immediate surrounding 338 acres in 1973 to provide a trout fishery. In 2001, AZGFD purchased an additional 296 acres for the management of sensitive species and their habitats. The acquisitions were funded through Federal Aid in the Restoration of Wildlife Funds (WSFR) and Heritage Acquisition Funds.

The primary intention for the BLWA is to conserve and enhance sensitive habitats, maintain and enhance the Becker Lake Trout fishery, and provide a quality visitor experience with opportunities for trout fishing and wildlife sightseeing. Protection of federally-listed and threatened species is paramount, with emphasis on the Little Colorado spinedace, and Western yellow-billed cuckoo.

Due to funding and other timing constraints, the Habitat Improvement Demonstration Project along the Little Colorado River (LCR) riparian corridor will occur in 2 phases (Figure 5). Phase 1 of the Habitat Improvement Demonstration Project will focus on work outside of jurisdictional areas including trail and ditch work, bioengineering, backwater work and floodplain improvements (Figure 6). Phase 1 activities described in the Project Description below are those that can occur outside of jurisdictional waters, thus not requiring an Army Corps of Engineers 404 permit; Phase 1 activities are described below and are covered under this EAC.

Phase 2 will consist of instream improvements and vegetation plantings and reseeded. All activities occurring within jurisdictional waters will be conducted under Phase 2, and will be covered under separate environmental compliance (a future Amendment to this EAC).

PURPOSE AND NEED

The project's activities are intended to ultimately improve morphological and ecological diversity of the Little Colorado River through Becker Lake Wildlife Area. The proposed backwater channels, re-established floodplain channels, bioengineered wood and rock structures, and native revegetation designated in the design plans are intended to reduce erosion, sediment pollution, and shear stress on streambanks within the river corridor. These design elements will provide refugia, habitat coverage, egg mass attachment points, foraging opportunities, and dense native riparian thickets that will aid in general bird breeding activities.

Plans to plant the riparian corridor with native willow and cottonwood stands will increase canopy diversity and fulfill dense foliage requirements for the listed Western yellow-billed cuckoo's breeding and nesting needs, as well as boost insect prey population.

Bank stabilization, erosion reduction, and revegetation are anticipated to have long-term benefits to the Yellow-billed Cuckoo through the enhancement of the habitat and improved water quality in the Little Colorado River.

The listed Little Colorado River spinedace will also benefit from the stabilized riparian channel. Enhanced emergent vegetation will provide additional refugia, breeding, and foraging habitat for an overall beneficial effect on all life stages for the spinedace. Excavation of backwater pools will create water depth variability, and thus also create increased aquatic habitat during low water years, further benefiting the species. The overall increased wetland coverage and riparian habitat formed by the bioengineered structures will be able to host a variety of aquatic and terrestrial macroinvertebrates that can serve as food for the spinedace.

The design plans also call for realignment of, and specific plantings for, the river trail to provide a buffer for natural processes while allowing for natural, beneficial beaver activity, agriculture, and recreational viewing and access.

Specifically, the restoration objectives include:

1. Reconnect relic floodplain channels and backwaters to increase out-of-bank flows and reduce shear stress on the corridor streambanks.
2. Decrease the erosion potential of cut-banks to reduce sediment pollution and enhance aquatic habitat diversity.
3. Increase the area of inundation at base flow to expand near stream wetland and backwater habitat
4. Adjust the existing trail alignment to provide a buffer for natural river processes, beaver activity, and agriculture, while maintaining access and viewing opportunities.
5. Establish a mosaic of native plant species found naturally in the watershed to increase the area of wetland, riparian, and upland habitat.

PROJECT DESCRIPTION

The habitat restoration project at the Becker Lake Wildlife Area's Riverwalk consists of a 47.5-acre habitat improvement project within the Little Colorado River (LCR) riparian corridor (Figures 1-5). The total length of the project runs approximately 6,400 linear feet along the LCR. Phase 1 of the Habitat Improvement Demonstration Project will focus on work outside of jurisdictional areas including trail and ditch work, bioengineering, backwater work and floodplain improvements (Figure 6). Phase 1 activities described below are those that can occur outside of jurisdictional waters, thus not requiring an Army Corps of Engineers 404 permit; Phase 1 activities are described below and are covered under this EAC.

Habitat Improvement Demonstration Project - Phase 1

Project activities will fall into the following phases: Site prep, earthworks, trail and ditch work, bioengineering, backwater work and floodplain improvements. Construction activities are anticipated to take no longer than 10-16 weeks, and will be conducted by a combination of contractors and Department personnel. Large equipment will be mobilized and stationed at the current River Walk parking lot onsite. All heavy equipment would be cleaned prior to construction to avoid introducing non-native invasive plants. All construction activities will be completed outside of the active breeding season for the Western yellow-billed cuckoo, unless a monitor is present.

Site Preparation

The footprint of earthwork cut/fill and to-be-installed structures, as designated on the plan, will be cleared mechanically (by excavators or backhoes) and by hand-held power tools such as chainsaws, weed whackers, and power brush cutters. Any undesirable, invasive plants found in the footprint of earthwork cut/fill and to-be-installed structures will be pulled, dug out, or mulched over to prevent regrowth and reduce competition with native plants to be planted. Cleared plant material shall be left on site and placed outside the river corridor in designated areas. Currently, AZGFD routinely controls for invasive plants such as Siberian elm, Russian olive, exotic common reed grass, and Musk thistle within the BLWA, but if any additional species are detected, they will be treated appropriately, and will be disposed of offsite if resprout from mulching could occur. Any cottonwood, willow, or other native trees and shrubs on site will be preserved, with critical root zone delineated so that heavy machinery won't damage the specimens.

Earthwork

Earthworks will involve the recontouring for future reconnection of relic floodplain channels to the river, as well as the excavation of backwater wetlands to ease hydraulic pressure during flood events; all of these activities will occur outside of the Ordinary High Water Mark (OHWM) shown in red on Figures 6a and 6b. A low ground pressure excavator, or similar, will likely be used for these activities. The OHWM will be staked or marked then allowing all work to be conducted outside of the OHWM, see Figure 6c. The excavated soil from on site will be used for construction of floodplain benches/bars as shown in the preliminary drawings. The excavator will be used to create topographic/soil saturation variation and gradual sloping in the currently, relatively flat, featureless floodplain. Existing headcuts will also be reshaped, such that the steep vertical drops and resulting erosion and channel incision are reduced. Meanders will be carved along the riparian corridor in the project area; these forms will help dissipate the energy of the running water and allow gentle overflow onto the surrounding floodplains, further reducing future erosion. Pools and basins will also be excavated.

5,500 cubic yards of earth will be excavated into the existing floodplains to create connector swales. Another 500 cubic yards will be excavated to create floodplain channels. 1,200 cubic yards will be excavated for backwater channels. 1,800 cubic yards of earth will be excavated and shaped for banklines and pools. Finally, an irrigation ditch 790 ft long will be excavated on site (context). A Stormwater Pollution Prevention Plan (SWPPP) will be prepared by either Oxbow or the construction contractor; this plan will detail measures and Best Management Practices (BMP) to be implemented to prevent sedimentation into the existing channel, such as the installation of silt fence and other erosion control materials. Excavated material (i.e. spoils) will be stored onsite for use during the future Phase 2 to plug the existing channel.

Stream & Floodplain Structures

After earthwork is complete, floodplain structures will be constructed using a combination of rocks, logs, and other natural debris found onsite. Floodplain structures to be built onsite will include 3 riffles, 600 linear feet of bioengineered streambank benches, and 9 juniper log jams.

Reshaped headcuts, the inlets and outlets of new meander pools, and newly excavated basins and channels will be lined with rocks embedded into the soil to bolster erosion resistance while creating aquatic habitat. The log jams, constructed from woody debris, will be placed across the floodplain at the top of constructed bars and benches. These woody structures will provide habitat coverage, egg mass attachment points, and potential points for future beaver dam activity while also introducing hydraulic variation and flow convergence for scour pool creation.

Trail Realignment

To address the degradation of the existing river trail, a new river trail running approximately 2,500 feet will be constructed within the planned cottonwood gallery planting. A force plate compactor/mechanized tamper or similar will be used to flatten the graded trail. Weed fabric and the $\frac{3}{4}$ Minus gravel will be added and compacted to stabilize the dirt trail. Interpretive and other signage, benches, and safety fencing/railing associated with the trail will be placed along the new river trail as appropriate.

All native plantings will occur under Phase 2, once the current channel can be connected to the new alignment created during Phase 1.

ACCESS TO SITE

Access to the project area will be from Highway 191 to the River Walk parking lot.

HABITAT DESCRIPTION AT PROJECT SITE

Habitats found on/near the project site include: 1) Approximately $\frac{3}{4}$ mile of Little Colorado River streamside habitat, 2) 120 acres of wet meadow, 3) approximately 5 acres of stream riparian habitat, 4) bands of narrow leaf cottonwood trees clustered along the Becker Lake filler ditch and south of the lake, 5) the 85-acre Becker Lake, and 6) an upland plains grassland community.

COORDINATION

Oxbow engineering and AGFD staff.

PROJECT MAPS/PHOTOS



Figure 1: Location of Becker Lake Wildlife Area within the state

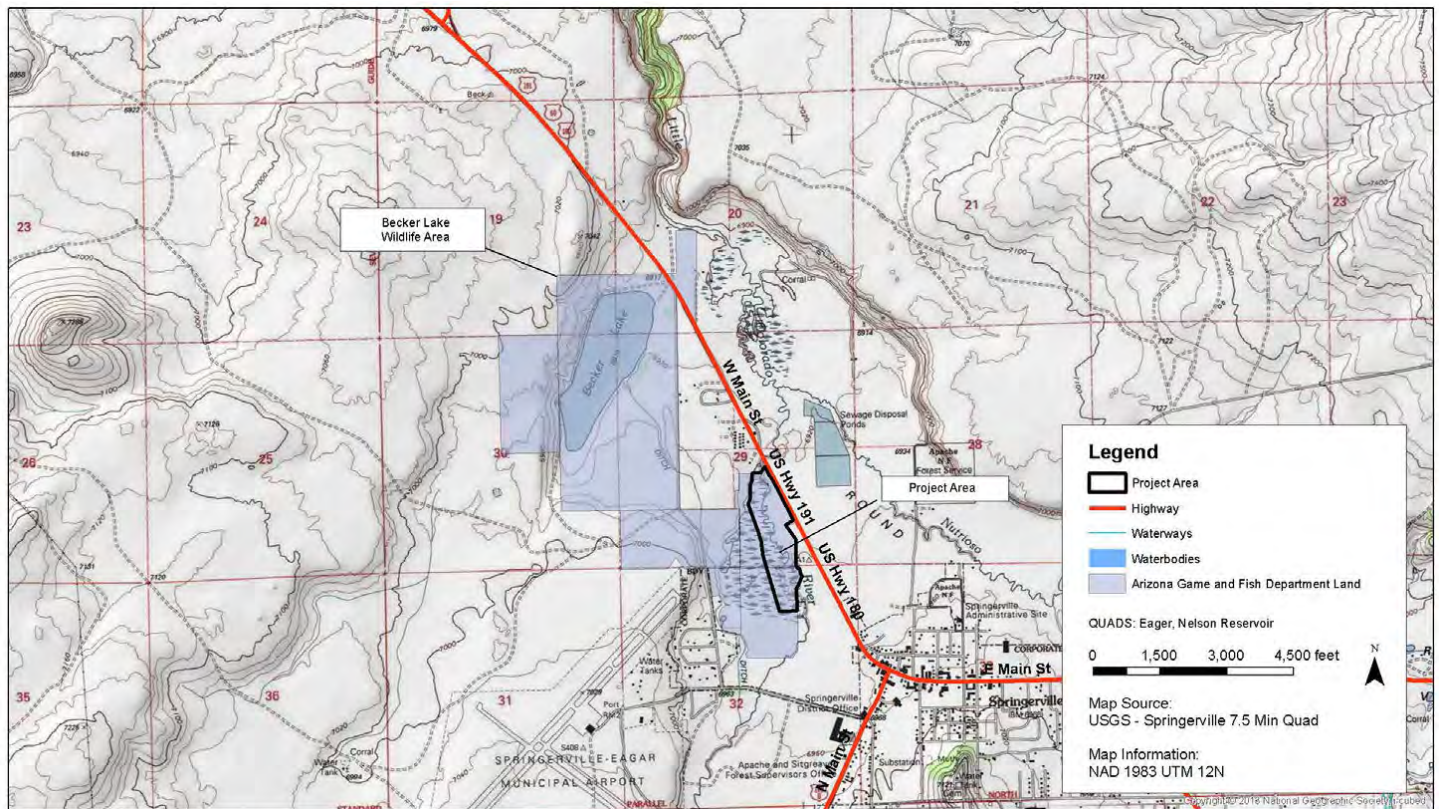
















Figure 1: Regional location of the Becker Lake WA habitat improvement project area



Figure 3: Photo of project area along the Little Colorado River, facing south.



Figure 4: Relic floodplains channel network within the Little Colorado River floodplain

| DIVISION 200: EARTHWORK | | |
|---|---|---|
| - | Complete Site Preparation Activities | |
|  | Floodplain Connector Swales: Excavate & Shape | 5 |
|  | Floodplain Channels: Re-Contour & Shape | |
|  | Backwater Channels: Excavate & Shape | 1 |
|  | Streambank Soil Bioengineering: Excavate & Shape Bankline & Pools | 1 |
|  | Irrigation Ditch: Excavate | |
|  | River Trail: Construct & Surface | 2 |
| DIVISION 300: STREAM & FLOODPLAIN STRUCTURES | | |
|  | Constructed Riffles: Supply & Construct | |
|  | Streambank Soil Bioengineering: Supply & Construct Toe Wood Bench | |
|  | Beaver Dam Reinforcement & Repair: Supply & Construct | |
|  | Log Jam: Supply & Construct | |
| DIVISION 400: NATIVE PLANTINGS | | |
|  | Supply & Plant Marsh Zone | |
|  | Supply & Plant Riparian Sandbar Willow Zone | |
|  | Supply & Plant Riparian Cottonwood & Willow Zone | |
|  | Supply & Plant Pollinator Habitat Zone | |

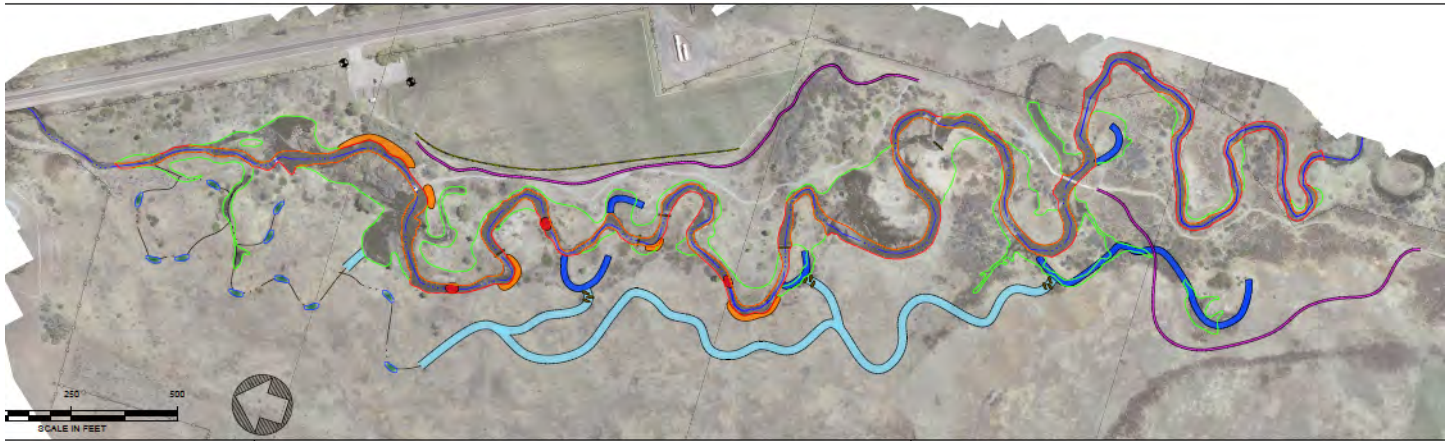


Figure 5: Becker Lake Demonstration Project Phase 1 & 2 (Phase 2 not covered under this EAC)

Phasing Notes:

Habitat improvements during Phase 1 of the project will focus on work outside of jurisdictional areas, including trail and ditch work, bioengineering and backwater work, and floodplain improvements.

Legend














-  Control Point
-  Fenceline (Approximate)
-  Existing Relic Floodplain Channel Network
-  Ordinary High Water Mark (from Approved PJD)
-  Wetlands (from Approved PJD)
-  Construction Item View, Section, or Detail Indicator: Letter Designation (Top) and Sheet Reference (Bottom)
-  Floodplain Connector Swales: Excavate & Shape
-  Floodplain Channels: Re-Contour & Shape
-  Backwater Channels: Excavate & Shape
-  Streambank Soil Bioengineering: Excavate & Shape Bankline & Pools and Construct Toe Wood Bench
-  Irrigation Ditch: Excavate
-  River Trail: Construct & Surface
-  Log Jam: Supply & Construct



Figure 6a: Northern half of Becker Lake Demonstration Project Phase 1

Phasing Notes:

Habitat improvements during Phase 1 of the project will focus on work outside of jurisdictional areas, including trail and ditch work, bioengineering and backwater work, and floodplain improvements.

Legend














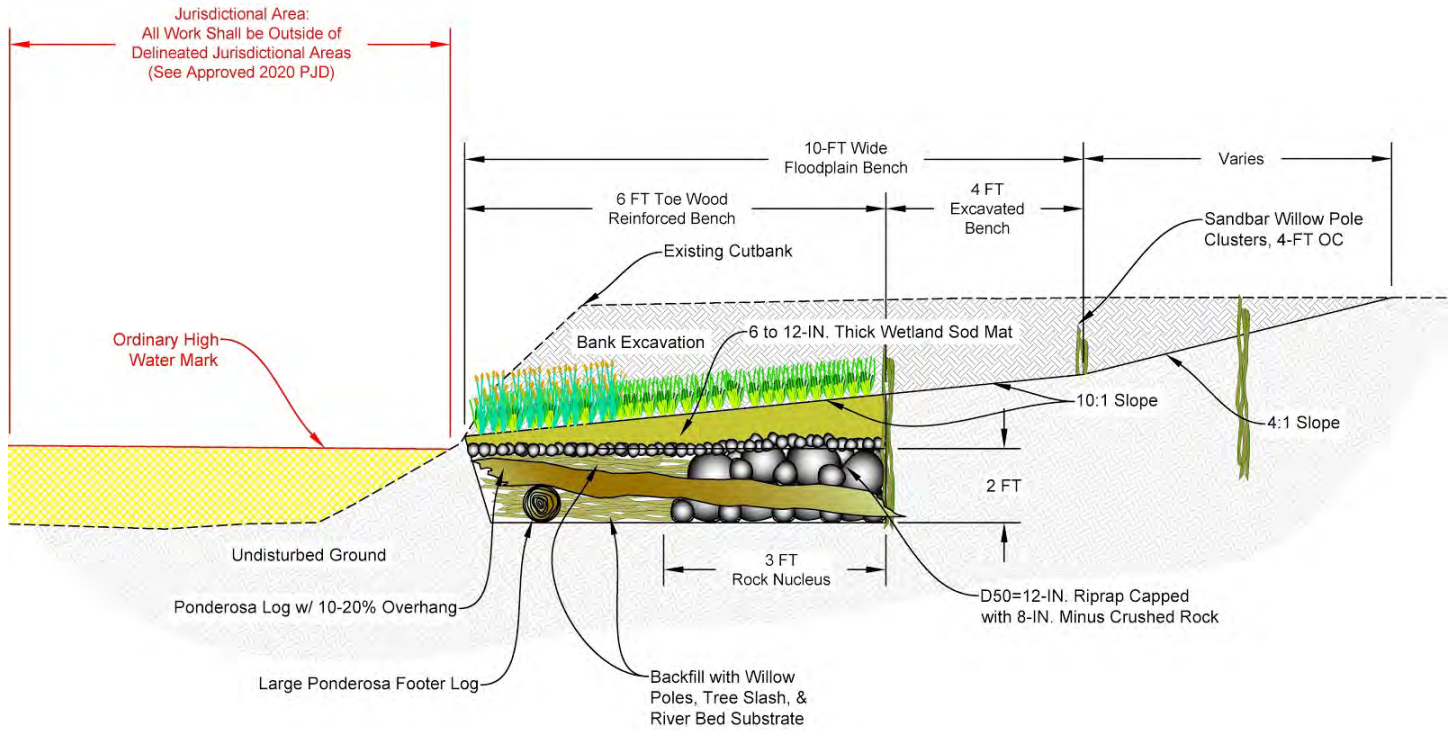
-  Control Point
-  Fenceline (Approximate)
-  Existing Relic Floodplain Channel Network
-  Ordinary High Water Mark (from Approved PJD)
-  Wetlands (from Approved PJD)
-  Construction Item View, Section, or Detail Indicator: Letter Designation (Top) and Sheet Reference (Bottom)
-  Floodplain Connector Swales: Excavate & Shape
-  Floodplain Channels: Re-Contour & Shape
-  Backwater Channels: Excavate & Shape
-  Streambank Soil Bioengineering: Excavate & Shape Bankline & Pools and Construct Toe Wood Bench
-  Irrigation Ditch: Excavate
-  River Trail: Construct & Surface
-  Log Jam: Supply & Construct



Figure 6b: Southern half of Becker Lake Demonstration Project Phase 1



A.1 Streambank Soil Bioengineering
 - Typical Section NTS

Figure 6c: OHWL avoidance during streambank soil bioengineering.

**ARIZONA GAME AND FISH DEPARTMENT
ENVIRONMENTAL ASSESSMENT CHECKLIST**

DEVELOPMENT QUESTIONS

PROVIDE A DETAILED EXPLANATION

For any item (A or B), describe the impact(s) or issue(s) and explain information or actions that will be implemented to address/resolve the particular item(s). If necessary, coordinate with the Development Branch and/or Habitat Branch to complete explanation(s). **Be sure to fill out and submit the Development Project Proposal Form to the Development Branch prior to submittal of the EAC.** The form can be found on the Intranet under Development & Engineering.

YES NO

- A. Does the project result in the construction, modification, improvement or demolition of physical assets (i.e. buildings, utilities, water and wastewater facilities, shooting range infrastructure, hatchery infrastructure, wildlife area infrastructure, boating and fishing facilities, dams, wildlife waters, fish barriers, water control structures and impoundments, wetlands, wells and water pumping systems, recreational facilities, road construction and improvements, trails, fences and vehicular access controls). If yes, identify design, construction and maintenance considerations to be addressed.**

This project will result in the modification of channel features, wetland areas and trail route to improve riparian and aquatic habitats. For additional details see the Project Description above as well as the attached Becker Lake Wildlife Area Little Colorado River Habitat Improvement Project Final Design - 100% Submittal, as updated in December 2020 for Phasing, and the Becker Lake Wildlife Area Little Colorado River Habitat Improvement Project Technical Specifications – 100% Submittal.

- B. Involve facilities intended for public use and subject to federal non-discrimination requirements including the provision of access for persons with disabilities? If yes, identify design considerations to be addressed.**

**ARIZONA GAME AND FISH DEPARTMENT
 ENVIRONMENTAL ASSESSMENT CHECKLIST**

TERRESTRIAL AND AQUATIC QUESTIONS

PROVIDE A DETAILED EXPLANATION

For any item (C through G) describe any impact(s) or issue(s) and explain information or actions that will be implemented to address/resolve the particular item(s). Check yes for positive and/or negative impacts.

YES

NO

C. Affect any game species? If yes, identify species.

Terrestrial

Terrestrial

D. Affect any species listed as a Species of Greatest Conservation Need (SGCN) in Arizona’s State Wildlife Action Plan (SWAP)? If yes, identify species.

Terrestrial

Terrestrial

Habitat for many aquatic and riparian species will be improved. Negative impacts will be short term, with beneficial effects anticipated following project completion.

Aquatic

Aquatic

Habitat for many aquatic and riparian species will be improved. Negative impacts will be short term, with beneficial effects anticipated following project completion.

E. Affect any species protected under the Bald and Golden Eagle Act or the Migratory Bird Treaty Act? (Check yes for positive and/or negative impacts) If yes, identify species and impact(s).

Terrestrial

Terrestrial

Only positive effects are expected for Bald or Golden Eagles. Increased water availability will allow the department to better manage the property for other wildlife species that could provide increased prey opportunities for both species including but not limited to waterfowl and small mammals.

No trimming or removal of trees/shrubs that could provide nesting opportunities for migratory birds will occur during the breeding season. Breeding season for birds at this elevation generally begins in May, so vegetation removal will occur as early in April as possible. If for any reason the project is delayed and vegetation removal must be conducted during the breeding season, the Department’s Project Coordinator will coordinate with the Department’s Avian Species Coordinator to determine appropriate avoidance or minimization measures, including surveys to identify nesting activities, to ensure no nesting migratory birds are impacted due to project activities.

F. Affect any species protected under the Endangered Species Act and/or candidate species? If yes, identify species and impact(s).

Terrestrial

✓

Terrestrial

□

The proposed Phase 1 habitat restoration project is not likely to jeopardize the continued existence of the **Mexican Wolf**. The Wenima Wildlife Area falls within Zone 1 of the 10(j) non-essential, experimental population [10(j) NEP], area for the Mexican Wolf, and also within the current known range of the species. While this species generally remains within the rugged and higher elevation mountains along the Mogollon Rim to the south and east of the project, the Little Colorado River may serve as a movement corridor for this species if it ranges into the surrounding lower elevation lands. In the unlikely event that a Mexican Wolf moves through the Becker Lake Wildlife Area, construction activities would occur only during daylight hours and are not expected to encounter this nocturnal/crepuscular animal. In the unlikely event that this species is encountered during construction activities, all personnel would temporarily vacate the premises until the animal has moved out of the project area.

The proposed Phase 1 habitat restoration project may affect, but is not likely to adversely affect, the **Southwestern Willow Flycatcher**. This neotropical migrant bird typically arrives on the breeding grounds between early May and mid-June, and nesting commences in mid-May and continues through late July. In Arizona, habitat selection has been correlated to the densest riparian vegetation on the landscape, broad floodplains that allow vegetation to develop in dense patches of tamarisk and willow. As seen in Figure 3, the riparian vegetation along the LCR at the project location lacks the density and structure of willow thickets to support breeding Southwestern Willow Flycatchers. The nearest records of breeding Southwestern Willow Flycatcher are over 7 miles upstream of the project site along the LCR, at its confluence with the South Fork of the LCR; this is also the nearest location of designated critical habitat for this species. According to eBird.org, there are a few Southwestern Willow Flycatcher observations in the project vicinity, but all observations appear to be recorded during migration (T. Corman pers. comm.). Phase 1 will be affecting very few of the mature trees along the river, but the few that might be removed are tall cottonwood or alder trees. The few trees that will be trimmed or removed as part of Phase 1 will be removed (or at least the canopy lopped off) in April, prior to breeding season; therefore, in the unlikely event that this species is in the vicinity during construction, no direct impacts would occur as a result of vegetation removal. Additionally, due to the lack of suitable breeding habitat on-site, no indirect impacts to nesting flycatchers are expected due to noise or vibration during construction. If for any reason the project is delayed and vegetation removal must be conducted during the breeding season for this species, the Department's Project Coordinator will coordinate with the Department's Avian Species Coordinator to conduct surveys and determine appropriate avoidance or minimization measures to ensure no adverse effects occur due to project activities.

The proposed Phase 1 habitat restoration project may affect, but is not likely to adversely affect, the **Yellow-billed Cuckoo**. This neotropical migrant bird typically arrives on the breeding grounds beginning in June; the earliest egg reported in Arizona is June 15 with nesting activity continuing through August and frequently

into September. In Arizona, this species is found primarily below 5,000 ft., in habitat dominated by Fremont Cottonwood (*Populus fremontii*), Willow (*Salix spp.*), Ash (*Fraxinus velutina*), and Mesquite (*Prosopis spp.*). The only record of Yellow-billed Cuckoos breeding in the vicinity was recorded about 3 miles north of the project area in 2000 by Department biologist Troy Corman (T. Corman pers. comm.; HDMS 2021), and a non-breeding observation was reported along the River Walk in 2016 (eBird 2021). As seen in Figure 3, the LCR within the River Walk supports a few riparian trees of suitable height to support breeding Yellow-billed Cuckoos, but the overall amount of habitat present is limited. Phase 1 may require removing a small number of these taller trees that are situated in close proximity to the River Walk parking lot; these trees will be removed (or at least the canopy lopped off) in April, prior to breeding season; therefore, in the unlikely event that this species is in the vicinity during construction, no direct impacts would occur as a result of vegetation removal. Additionally, due to the very limited amount of breeding habitat adjacent to the Phase 1 project footprint, no indirect impacts to nesting cuckoos are expected due to noise or vibration during construction. If for any reason the project is delayed and vegetation removal must be conducted during the breeding season for this species, the Department’s Project Coordinator will coordinate with the Department’s Avian Species Coordinator to conduct surveys and determine appropriate avoidance or minimization measures to ensure no adverse effects occur due to project activities.

Aquatic
✓

Aquatic

The proposed Phase 1 habitat restoration project may affect, but is not likely to adversely affect, **Little Colorado Spinedace**. This species was once abundant in the mainstem part of the upper Little Colorado River and cool water tributaries (Silver, Show Low, Chevelon, and Clear Creeks), but its current distribution is limited to locations in the Little Colorado River mainstem, including where it flows through the Becker Lake Wildlife Area, East Clear, Chevelon, Nutrioso, and Rudd Creeks. No construction activities will take place within the existing river channel where this species may occur, therefore, no direct effects to this species would occur. Additionally, the project SWPPP will address the BMPs to be implemented to minimize sedimentation from construction activities into the river. The nearest critical habitat for Little Colorado Spinedace is designated along Nutrioso Creek, over 7 miles from the project area; the confluence of Nutrioso Creek and the LCR is just downstream of the project area. Therefore, the project will have no effect on this species’ designated critical habitat.

G. Would any take of listed species resulting from the proposed activities be covered by the Department’s 10(a)(1)(A) Permit or Section 6 authorities? If so, what is the maximum level of take expected from the project?

Terrestrial

Terrestrial
✓

Aquatic

Aquatic
✓

**ARIZONA GAME AND FISH DEPARTMENT
ENVIRONMENTAL ASSESSMENT CHECKLIST**

PROJECT COORDINATOR QUESTIONS

PROVIDE A DETAILED EXPLANATION

For any item (H through V) that received a “yes” response, describe the impact(s) or issue(s) and explain information or actions that will be implemented to address/resolve the particular item(s). If necessary, coordinate with Habitat Branch, Terrestrial Branch, and/or Aquatic Branch to complete explanation(s).

YES NO

 H. Include the introduction of or exportation of any species not presently or historically occurring in the receiving location?

 I. Require the removal of native plants and/or native habitat, either intentionally or incidentally?

Earthwork and stream channel structure construction, as described in the Project Description section above and further detailed in the attached Project Description above as well as the attached Becker Lake Wildlife Area Little Colorado River Habitat Improvement Project Final Design - 100% Submittal; Becker Lake Wildlife Area: Little Colorado River Habitat Improvement Project Technical Specifications – 100% Submittal; and Preconstruction Notification Nationwide Permit for the Becker Lake Wildlife Area – Little Colorado River Habitat Improvement Project, Army Corps of Engineers file number SPL-2020-00300, will necessitate the removal native plants.

 J. Cause any ground disturbance or affect any archaeological, historical, religious shrine or cultural site or alter the aesthetics of the area? (Note: AAA permitted archaeologist must be used on Commission or state-owned lands and for state actions on private lands. Contact PEP’s Cultural Resource Compliance Manager to determine compliance needs.)

Earthwork as described in the Project Description section above and further detailed in the attached Project Description above as well as the attached Becker Lake Wildlife Area Little Colorado River Habitat Improvement Project Final Design - 100% Submittal as updated in December 2020 for phasing.

Discovery Clause:

If any previously unidentified cultural resources (including human remains or cremations) are encountered during any aspect of this project, the crew should immediately stop work at that specific location, take steps to protect the discovery, and immediately call the Arizona Game and Fish Department’s Cultural Resource Compliance Manager at 623-236-7620 (Office) in order to determine the appropriate treatment of the discovery.

 K. Have substantive sociological or socioeconomic consequences or affect public health and safety?

L. Be expected to have organized opposition, or generate substantial public controversy?

M. Involve land use changes such as planting, burning, clearing, grazing, or modification of public use?

The current trail route will be realigned to follow the LCR. The trail will be closed to public use during the 10-16 days of construction, but will otherwise be available.

N. Be located on or in the vicinity of lands owned or administered by the Arizona Game and Fish Commission and Department?

This project will be implemented on the Commission owned Becker Lake Wildlife Area. The project is consistent with the Becker Lake Operation and Management Plan to maintain and enhance aquatic habitat primarily for the LC spinedace, as well as sensitive riparian habitat. Also, the use of Heritage Funds for this project is consistent for the property as a whole, as Heritage Funds were used to acquire the property.

O. Involve the manipulation or use of surface or groundwater, or modify or deny access for water usage?

P. Involve any modification to, or development in a flood plain or wetland?

Stream channel modification/improvement and trail modifications will occur within the floodplain and associated wetlands of the Little Colorado River.

Q. Affect a designated Wilderness Area, Wild or Scenic River, prime or unique farmland or forestland, any ecologically critical area, National Trail, or other areas with special designation?

R. Result in any activity that will conflict with federal or state air or water quality regulations?

S. Include use or potential release of any toxicant?

T. Have any environmental impacts not addressed above, or result in cumulative impacts that separately do not require assessment but together may be considered substantial?

U. Require any federal, state or other permits? (Clean Water Act Sec. 401, 404; Arizona Department of Agriculture Salvage Permit; ROW for access; etc.)

V. Other NEPA compliance completed, and attached? (i.e. EA, FONSI, DN, BAE, ROD)

**ARIZONA GAME AND FISH DEPARTMENT
 ENVIRONMENTAL ASSESSMENT CHECKLIST**

DOCUMENTATION CHECKLIST

| <i>* Attach any documents identified here.</i> | | Not Applicable | Pending | Completed |
|---|---|--------------------------|--------------------------|--------------------------|
| HDMS Check | Project ID # HGIS-11329 | | <input type="checkbox"/> | ✓ |
| Engineering Review | | ✓ | <input type="checkbox"/> | <input type="checkbox"/> |
| Federal Documentation | | ✓ | <input type="checkbox"/> | <input type="checkbox"/> |
| USFS | Special Use Permit # | ✓ | <input type="checkbox"/> | <input type="checkbox"/> |
| ACOE | 404 NWP Permit # | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| ADEQ | 401 CWA Permit # | ✓ | <input type="checkbox"/> | <input type="checkbox"/> |
| ADWR | | ✓ | <input type="checkbox"/> | <input type="checkbox"/> |
| ASLD | | ✓ | <input type="checkbox"/> | <input type="checkbox"/> |
| Department of Agriculture | | ✓ | <input type="checkbox"/> | <input type="checkbox"/> |
| NHPA/SHPA (Cultural Laws) | <i>(Note: Archaeologist must be Arizona Antiquities Act (AAA) permitted on Commission or state-owned lands and for state actions on private lands. Contact PEP's Cultural Resource Compliance Manager to determine compliance needs.)</i> | <input type="checkbox"/> | <input type="checkbox"/> | ✓ |
| Landowner Coordination | | ✓ | <input type="checkbox"/> | <input type="checkbox"/> |
| Other | | ✓ | <input type="checkbox"/> | <input type="checkbox"/> |
| TO BE COMPLETED BY PEP & EAC REVIEWERS | | | | |
| PEP Review | Cheri Bouchér 1/20/21 | <input type="checkbox"/> | <input type="checkbox"/> | ✓ |
| Game Review | Amber Munig, 1/20/2021 | ✓ | <input type="checkbox"/> | <input type="checkbox"/> |
| Nongame Review | James Driscoll, 01/20/21 | | <input type="checkbox"/> | ✓ |
| Sport Fish Review | | ✓ | <input type="checkbox"/> | <input type="checkbox"/> |
| Native Fish Review | Julie Carter 2/23/21 | <input type="checkbox"/> | <input type="checkbox"/> | ✓ |

**ARIZONA GAME AND FISH DEPARTMENT
 ENVIRONMENTAL ASSESSMENT CHECKLIST**

SIGNATURES

| | | | | | | | |
|-------------------------|------------------------------------|--------------------------|--|--------------------------------------|-------------------------------|-------------------------|--|
| Project Coordinator | <u>David Dorum</u> Name | <u>01/13/21</u> Date | | Lands & Water Program | <u>James Ruff</u> Name | <u>1/27/21</u> Date | <input type="checkbox"/> NA |
| Project Leader | <u>Julie Carter</u> Name | <u>2/23/21</u> Date | | Cultural Resource Compliance Manager | <u>Abraham Arnett</u> Name | <u>03/08/21</u> Date | <input type="checkbox"/> NA |
| Branch Chief | _____ Name | _____ Date | <input checked="" type="checkbox"/> NA | Engineering | <u>Chris Cantrell</u> Name | <u>3/15/21</u> Date | <input type="checkbox"/> NA |
| Terrestrial | <u>Amber Munig for JA</u> Name | <u>1/20/2021</u> Date | | Region 1 Supervisor | <u>Aaron Hartzell</u> Name | <u>01/22/21</u> Date | <input type="checkbox"/> NA |
| Aquatic | <u>Geoffrey Rabinovich</u> Name | <u>1/29/2021</u> Date | <input type="checkbox"/> NA | Region 2 Supervisor | _____ Name | _____ Date | <input checked="" type="checkbox"/> NA |
| Assistant Director, WMD | _____ Name | _____ Date | <input checked="" type="checkbox"/> NA | Region 3 Supervisor | _____ Name | _____ Date | <input checked="" type="checkbox"/> NA |
| Habitat Branch Chief | <u>Luke Thompson</u> Name | <u>03/23/21</u> Date | | Region 4 Supervisor | _____ Name | _____ Date | <input checked="" type="checkbox"/> NA |
| | | | | Region 5 Supervisor | _____ Name | _____ Date | <input checked="" type="checkbox"/> NA |
| | | | | Region 6 Supervisor | _____ Name | _____ Date | <input checked="" type="checkbox"/> NA |

REFERENCES

- A. Americans with Disabilities Act, Section 504 of the Rehabilitation Act of 1973, (P.L.93-112).
- B. National Environmental Policy Act, 1969; CEQ Guidelines, 40 CFR (1502.16 part e).
- C. Section 7, Endangered Species Act of 1973, as amended.
- D. Species of Greatest Conservation Need, Arizona's State Wildlife Action Plan: 2012-2022, Arizona Game and Fish Department, Phoenix, Arizona.
- E. Executive Order 11987, Exotic Organisms; Executive Order 13112, Invasive Species; and 50 CFR 92.
- F. Arizona Native Plant Law (ARS 3-901 to 3-915, 3-931 to 3-934).
- G. Executive Order 11593, Protection and Enhancement of the Cultural Environment, (P.L. 93-291); Section 106 of the National Historic Preservation Act of 1966, as amended (U.S.C. 470), EO 11593; Archaeological and Historic Preservation Act of 1974, 5-24-74; CEQ guidelines, Federal Register 43(230), 11-29-78, Section 1508.8; Native American Graves and Repatriation Act (NAGPRA) (P.L. 101-601); American Indian Religious Freedom Act (AIRFA) (42 U.S.C.1996); Arizona Antiquities Act of 1927 (ARS 41-841 to 41-846); State Historic Preservation Act of 1982 (ARS 41-861 to 41-864); and the Burial Protection Law of 1990 (ARS 41-865).
- H. Acquisition and Disposition of Lands and Waters (ARS 17-241); Agreements with other Entities for Wildlife Management (ARS-231); Arizona Game & Fish Department Policy Manual (I2.4N).
- I. Water Development and Use (ARS-231/12c)
- J. Executive Order 11988, Floodplain Management; Executive Order 11990, Protection of Wetlands; the Clean Water Act Amendments of 1977, (P.L. 95-217); and Arizona Department of Environmental Quality standards (Arizona Administrative Code Title 18, Ch. 11(401)).
- K. Wild and Scenic Rivers Act, (P.L. 90-542); Wilderness Act, (P.L. 88-577); National Trails Act, (P.L. 90-543); Federal Land Planning Documents.
- L. Clean Air Act of 1970, (P.L. 91-604); Federal Water Pollution Control Act, (P.L. 92-500); Executive Order 11738; the Clean Water Act Amendments of 1977, (P.L. 95-217); and Arizona Department of Environmental Quality standards (Arizona Administrative Code Title 18, Ch. 11(401) .
- M. Laboratory Animal Welfare Act of 1966 (P.L. 89-544).

ADDITIONAL REFERENCES FOR PROJECT

COMPLIANCE DOCUMENTATION FORM

Funding

& Index #(s): Heritage – Index #13072

Project Title: *Becker Lake Wildlife Area - Little Colorado River Habitat Improvement Project*

Start Date: 3/23/2021

End Date: 3/23/2026

Endangered Species Act (ESA)

✓ Section 7 Biological Evaluation form is attached for review and determination.

National Environmental Policy Act (NEPA)

✓ Based on Commission Policy I2.2, Department actions have been examined per the Environmental Assessment Checklist process.

National Historic Preservation Act (NHPA) and/or State Historic Preservation Act (SHPA)

✓ Project location has been reviewed for cultural, archaeological, and historical resources. The AGFD Cultural Resource Compliance Manager consulted with the State Historic Preservation Office (SHPO). SHPO concurred with a finding of **No Historic or Cultural Properties Affected**.

| | | |
|----------------------|---------------|---------------|
| Habitat Branch Chief | Luke Thompson | 3/23/21 |
| | _____ Name | _____ Date |

SECTION 7 BIOLOGICAL EVALUATION FORM

PROJECT TITLE: *Becker Lake Wildlife Area - Little Colorado River Habitat Improvement Project*

PROJECT LOCATION

| SITE NAME AND/OR LANDOWNER | TOWNSHIP | RANGE | SEC | UTMs (NAD83) | |
|-------------------------------|----------|-------|--------|--------------|--|
| Becker Lake Wildlife Area | 9N | 29E | 29, 32 | | |

PROJECT DESCRIPTION

The habitat restoration project at the Becker Lake Wildlife Area's Riverwalk consists of a 47.5-acre habitat improvement project within the Little Colorado River (LCR) riparian corridor (Figures 1-5). The total length of the project runs approximately 6,400 linear feet along the LCR. Phase 1 of the Habitat Improvement Demonstration Project will focus on work outside of jurisdictional areas including trail and ditch work, bioengineering, backwater work and floodplain improvements (Figure 6). Phase 1 activities described below are those that can occur outside of jurisdictional waters, thus not requiring an Army Corps of Engineers 404 permit; Phase 1 activities are described below and are covered under this EAC.

Habitat Improvement Demonstration Project - Phase 1

Project activities will fall into the following phases: Site prep, earthworks, trail and ditch work, bioengineering, backwater work and floodplain improvements. Construction activities are anticipated to take no longer than 10-16 weeks, and will be conducted by a combination of contractors and Department personnel. Large equipment will be mobilized and stationed at the current River Walk parking lot onsite. All heavy equipment would be cleaned prior to construction to avoid introducing non-native invasive plants. All construction activities will be completed outside of the active breeding season for the Western yellow-billed cuckoo, unless a monitor is present.

Site Preparation

The footprint of earthwork cut/fill and to-be-installed structures, as designated on the plan, will be cleared mechanically (by excavators or backhoes) and by hand-held power tools such as chainsaws, weed whackers, and power brush cutters. Any undesirable, invasive plants found in the footprint of earthwork cut/fill and to-be-installed structures will be pulled, dug out, or mulched over to prevent regrowth and reduce competition with native plants to be planted. Cleared plant material shall be left on site and placed outside the river corridor in designated areas. Currently, AZGFD routinely controls for invasive plants such as Siberian elm, Russian olive, exotic common reed grass, and Musk thistle within the BLWA, but if any additional species are detected, they will be treated appropriately, and will be disposed of offsite if resprout from mulching could occur. Any cottonwood, willow, or other native trees and shrubs on site will be preserved, with critical root zone delineated so that heavy machinery won't damage the specimens.

Earthwork

Earthworks will involve the recontouring for future reconnection of relic floodplain channels to the river, as well as the excavation of backwater wetlands to ease hydraulic pressure during flood events; all of these activities will occur outside of the Ordinary High Water Mark (OHWM) shown in red on Figures 6a and 6b. A low ground pressure excavator, or similar, will likely be used for these activities. The OHWM will be staked or marked then allowing all work to be conducted outside of the OHWM, see Figure 6c. The excavated soil from

on site will be used for construction of floodplain benches/bars as shown in the preliminary drawings. The excavator will be used to create topographic/soil saturation variation and gradual sloping in the currently, relatively flat, featureless floodplain. Existing headcuts will also be reshaped, such that the steep vertical drops and resulting erosion and channel incision are reduced. Meanders will be carved along the riparian corridor in the project area; these forms will help dissipate the energy of the running water and allow gentle overflow onto the surrounding floodplains, further reducing future erosion. Pools and basins will also be excavated.

5,500 cubic yards of earth will be excavated into the existing floodplains to create connector swales. Another 500 cubic yards will be excavated to create floodplain channels. 1,200 cubic yards will be excavated for backwater channels. 1,800 cubic yards of earth will be excavated and shaped for banklines and pools. Finally, an irrigation ditch 790 ft long will be excavated on site (context). A Stormwater Pollution Prevention Plan (SWPPP) will be prepared by either Oxbow or the construction contractor; this plan will detail measures and Best Management Practices (BMP) to be implemented to prevent sedimentation into the existing channel, such as the installation of silt fence and other erosion control materials. Excavated material (i.e. spoils) will be stored onsite for use during the future Phase 2 to plug the existing channel.

Stream & Floodplain Structures

After earthwork is complete, floodplain structures will be constructed using a combination of rocks, logs, and other natural debris found onsite. Floodplain structures to be built onsite will include 3 riffles, 600 linear feet of bioengineered streambank benches, and 9 juniper log jams. Reshaped headcuts, the inlets and outlets of new meander pools, and newly excavated basins and channels will be lined with rocks embedded into the soil to bolster erosion resistance while creating aquatic habitat. The log jams, constructed from woody debris, will be placed across the floodplain at the top of constructed bars and benches. These woody structures will provide habitat coverage, egg mass attachment points, and potential points for future beaver dam activity while also introducing hydraulic variation and flow convergence for scour pool creation.

Trail Realignment

To address the degradation of the existing river trail, a new river trail running approximately 2,500 feet will be constructed within the planned cottonwood gallery planting. A force plate compactor/mechanized tamper or similar will be used to flatten the graded trail. Weed fabric and the $\frac{3}{4}$ Minus gravel will be added and compacted to stabilize the dirt trail. Interpretive and other signage, benches, and safety fencing/railing associated with the trail will be placed along the new river trail as appropriate.

All native plantings will occur under Phase 2, once the current channel can be connected to the new alignment created during Phase 1.

ACCESS TO SITE

Access to the project area will be from Highway 191 to the River Walk parking lot.

HABITAT DESCRIPTION AT PROJECT SITE

Habitats found on/near the project site include: 1) Approximately $\frac{3}{4}$ mile of Little Colorado River streamside habitat, 2) 120 acres of wet meadow, 3) approximately 5 acres of stream riparian habitat, 4) bands of narrow leaf cottonwood trees clustered along the Becker Lake filler ditch and south of the lake, 5) the 85-acre Becker Lake, and 6) an upland plains grassland community.

PROJECT MAPS/PHOTOS



Figure 1: Location of Becker Lake Wildlife Area within the state

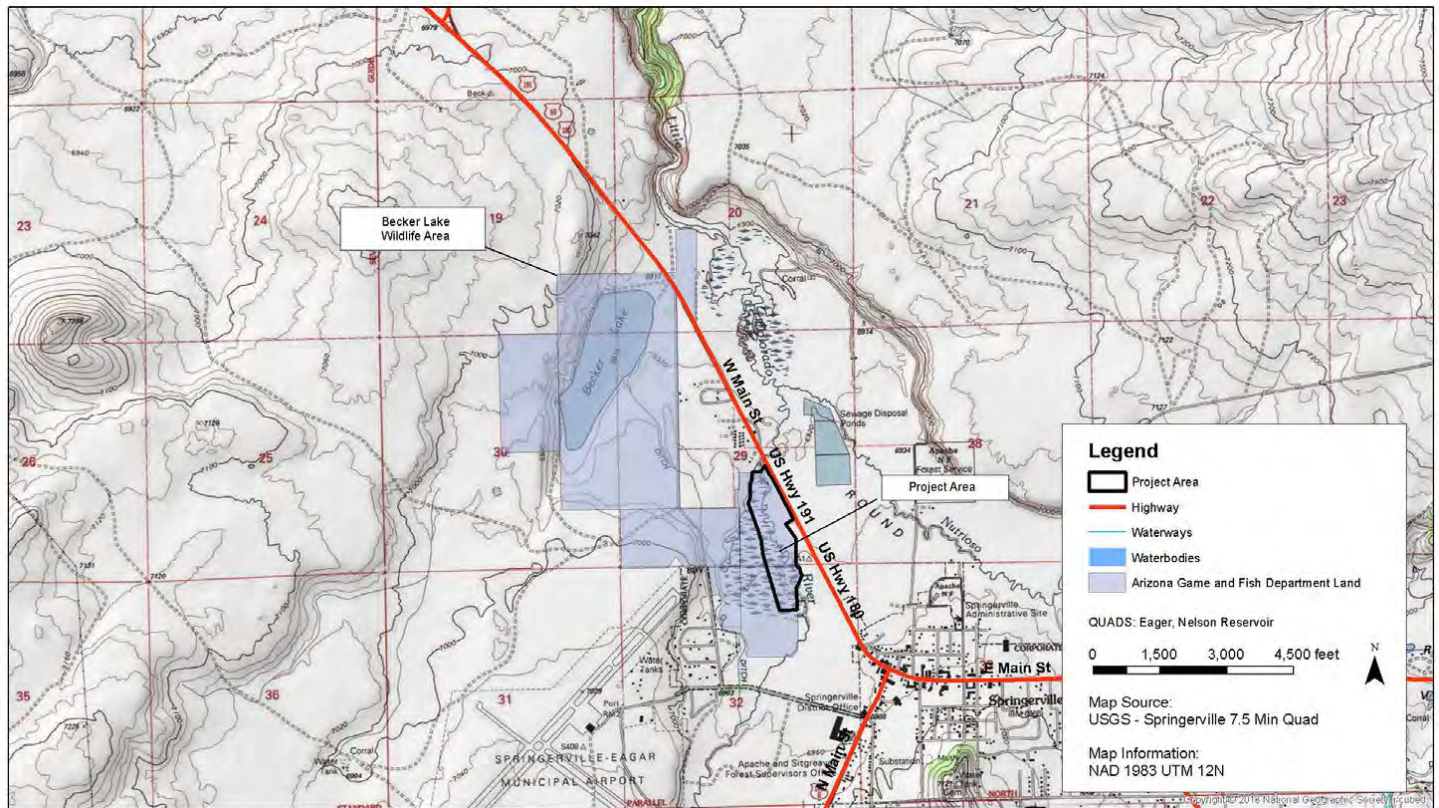


Figure 1: Regional location of the Becker Lake WA habitat improvement project area

















Figure 3: Photo of project area along the Little Colorado River, facing south.



Figure 4: Relic floodplains channel network within the Little Colorado River floodplain

Section 7 Biological Evaluation Form

Wenima Wildlife Area – Habitat Improvement Demonstration Project and Well Redevelopment

| DIVISION 200: EARTHWORK | |
|---|---|
| - | Complete Site Preparation Activities |
|  | Floodplain Connector Swales: Excavate & Shape |
|  | Floodplain Channels: Re-Contour & Shape |
|  | Backwater Channels: Excavate & Shape |
|  | Streambank Soil Bioengineering: Excavate & Shape Bankline & Pools |
|  | Irrigation Ditch: Excavate |
|  | River Trail: Construct & Surface |
| DIVISION 300: STREAM & FLOODPLAIN STRUCTURES | |
|  | Constructed Riffles: Supply & Construct |
|  | Streambank Soil Bioengineering: Supply & Construct Toe Wood Bench |
|  | Beaver Dam Reinforcement & Repair: Supply & Construct |
|  | Log Jam: Supply & Construct |
| DIVISION 400: NATIVE PLANTINGS | |
|  | Supply & Plant Marsh Zone |
|  | Supply & Plant Riparian Sandbar Willow Zone |
|  | Supply & Plant Riparian Cottonwood & Willow Zone |
|  | Supply & Plant Pollinator Habitat Zone |

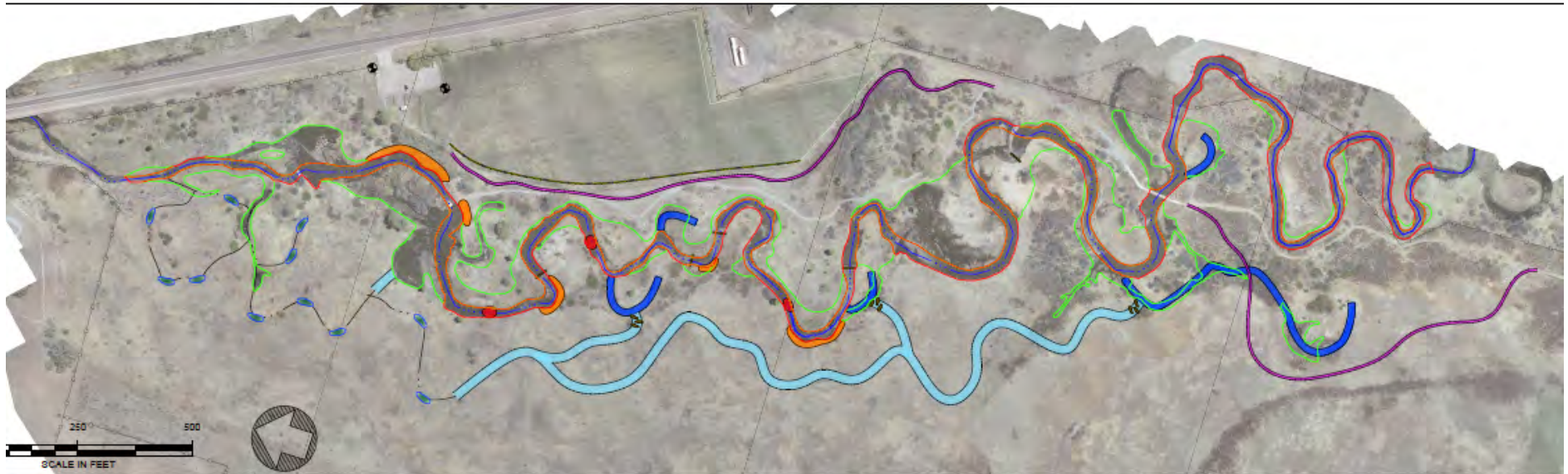


Figure 5: Becker Lake Demonstration Project Phase 1 & 2 (Phase 2 not covered under this EAC)

Phasing Notes:

Habitat improvements during Phase 1 of the project will focus on work outside of jurisdictional areas, including trail and ditch work, bioengineering and backwater work, and floodplain improvements.

Legend














-  Control Point
-  Fenceline (Approximate)
-  Existing Relic Floodplain Channel Network
-  Ordinary High Water Mark (from Approved PJD)
-  Wetlands (from Approved PJD)
-  Construction Item View, Section, or Detail Indicator:
Letter Designation (Top) and Sheet Reference (Bottom)
-  Floodplain Connector Swales: Excavate & Shape
-  Floodplain Channels: Re-Contour & Shape
-  Backwater Channels: Excavate & Shape
-  Streambank Soil Bioengineering: Excavate & Shape Bankline & Pools and Construct Toe Wood Bench
-  Irrigation Ditch: Excavate
-  River Trail: Construct & Surface
-  Log Jam: Supply & Construct



Figure 6a: Northern half of Becker Lake Demonstration Project Phase 1

Phasing Notes:

Habitat improvements during Phase 1 of the project will focus on work outside of jurisdictional areas, including trail and ditch work, bioengineering and backwater work, and floodplain improvements.

Legend














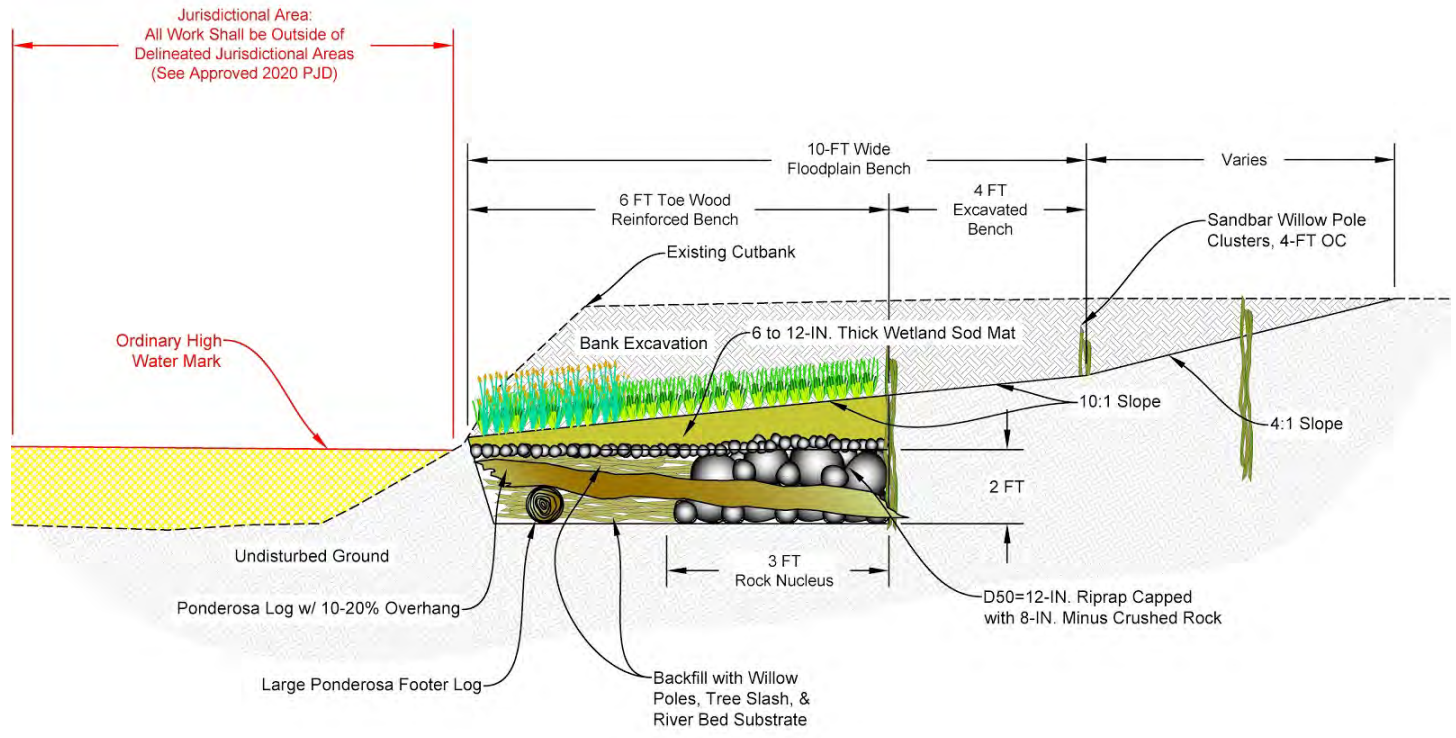
-  Control Point
-  Fenceline (Approximate)
-  Existing Relic Floodplain Channel Network
-  Ordinary High Water Mark (from Approved PJD)
-  Wetlands (from Approved PJD)
-  Construction Item View, Section, or Detail Indicator: Letter Designation (Top) and Sheet Reference (Bottom)
-  Floodplain Connector Swales: Excavate & Shape
-  Floodplain Channels: Re-Contour & Shape
-  Backwater Channels: Excavate & Shape
-  Streambank Soil Bioengineering: Excavate & Shape Bankline & Pools and Construct Toe Wood Bench
-  Irrigation Ditch: Excavate
-  River Trail: Construct & Surface
-  Log Jam: Supply & Construct



Figure 6b: Southern half of Becker Lake Demonstration Project Phase 1



A.1 Streambank Soil Bioengineering
- Typical Section NTS

Figure 6c: OHWM avoidance during streambank soil bioengineering.

FEDERALLY LISTED SPECIES IN THE ACTION AREA

Although the IPAC list (attached) reflects additional species and critical habitat, they will not be assessed in this document because HDMS reflects that there is no species occurrence or suitable habitat in the action area and therefore there will be No Effect to these species. The following are Endangered, Threatened, or Candidate species, and Designated or Proposed Critical Habitat, that have been identified from the Arizona Game and Fish Department’s Heritage Database Management System as occurring within the project action area are analyzed herein.

| | | |
|--------------------------------|--|-------------|
| Little Colorado Spinedace | <i>Lepidomeda vittata</i> | LT |
| Mexican Wolf | <i>Canis lupus baileyi</i> | LE,XN 10(j) |
| Southwestern Willow Flycatcher | <i>Empidonax traillii extimus</i> | LE |
| Yellow-billed Cuckoo | <i>Coccyzus americanus</i> (Western DPS) | LT |

ASSESSMENT OF EFFECTS

The proposed Phase 1 habitat restoration project may affect, but is not likely to adversely affect, **Little Colorado Spinedace**. This species was once abundant in the mainstem part of the upper Little Colorado River and cool water tributaries (Silver, Show Low, Chevelon, and Clear Creeks), but its current distribution is limited to locations in the Little Colorado River mainstem, including where it flows through the Becker Lake Wildlife Area, East Clear, Chevelon, Nutrioso, and Rudd Creeks. No construction activities will take place within the existing river channel where this species may occur, therefore, no direct effects to this species would occur. Additionally, the project SWPPP will address the BMPs to be implemented to minimize sedimentation from construction activities into the river. The nearest critical habitat for Little Colorado Spinedace is designated along Nutrioso Creek, over 7 miles from the project area; the confluence of Nutrioso Creek and the LCR is just downstream of the project area. Therefore, the project will have no effect on this species’ designated critical habitat.

The proposed Phase 1 habitat restoration project is not likely to jeopardize the continued existence of the **Mexican Wolf**. The Wenima Wildlife Area falls within Zone 1 of the 10(j) non-essential, experimental population [10(j) NEP], area for the Mexican Wolf, and also within the current known range of the species. While this species generally remains within the rugged and higher elevation mountains along the Mogollon Rim to the south and east of the project, the Little Colorado River may serve as a movement corridor for this species if it ranges into the surrounding lower elevation lands. In the unlikely event that a Mexican Wolf moves through the Becker Lake Wildlife Area, construction activities would occur only during daylight hours and are not expected to encounter this nocturnal/crepuscular animal. In the unlikely event that this species is encountered during construction activities, all personnel would temporarily vacate the premises until the animal has moved out of the project area.

The proposed Phase 1 habitat restoration project may affect, but is not likely to adversely affect, the **Southwestern Willow Flycatcher**. This neotropical migrant bird typically arrives on the breeding grounds between early May and mid-June, and nesting commences in mid-May and continues through late July. In Arizona, habitat selection has been correlated to the densest riparian vegetation on the landscape, broad floodplains that allow vegetation to develop in dense patches of tamarisk and willow. As seen in Figure 3, the riparian vegetation along the LCR at the project location lacks the density and structure of willow thickets to support breeding Southwestern Willow Flycatchers. The nearest records of breeding Southwestern Willow

Flycatcher are over 7 miles upstream of the project site along the LCR, at its confluence with the South Fork of the LCR; this is also the nearest location of designated critical habitat for this species. According to eBird.org, there are a few Southwestern Willow Flycatcher observations in the project vicinity, but all observations appear to be recorded during the migration period only (T. Corman pers. comm.). Phase 1 will be affecting very few of the mature trees along the river, but the few that might be removed are tall cottonwood or alder trees. The few trees that will be trimmed or removed as part of Phase 1 will be removed (or at least the canopy lopped off) in April, prior to breeding season; therefore, in the unlikely event that this species is in the vicinity during construction, no direct impacts would occur as a result of vegetation removal. Additionally, due to the lack of breeding season detections and suitable breeding habitat on-site, no indirect impacts to nesting flycatchers are expected due to noise or vibration during construction. If for any reason the project is delayed and vegetation removal must be conducted during the breeding season for this species, the Department's Project Coordinator will coordinate with the Department's Avian Monitoring Coordinator to conduct surveys and determine appropriate avoidance or minimization measures to ensure no adverse effects occur due to project activities.

The proposed Phase 1 habitat restoration project may affect, but is not likely to adversely affect, the **Yellow-billed Cuckoo**. This neotropical migrant bird typically arrives on the breeding grounds beginning in June; the earliest egg reported in Arizona is June 15 with nesting activity continuing through August and frequently into September. In Arizona, this species is found primarily below 5,000 ft., in habitat dominated by Fremont Cottonwood (*Populus fremontii*), Willow (*Salix spp.*), Ash (*Fraxinus velutina*), and Mesquite (*Prosopis spp.*). However, they have been documented nesting occasionally at higher elevations, such as between Springerville and St. Johns. The only record of Yellow-billed Cuckoos breeding in the vicinity was recorded about 3 miles north of the project area in 2000 by Department biologist Troy Corman (T. Corman pers. comm.; HDMS 2021), and a non-breeding observation was reported along the River Walk in 2016 (eBird 2021). As seen in Figure 3, the LCR within the River Walk supports a few riparian trees of suitable height to support breeding Yellow-billed Cuckoos, but the overall amount of habitat present is limited. Phase 1 may require removing a small number of these taller trees that are situated in close proximity to the River Walk parking lot; these trees will be removed (or at least the canopy lopped off) in April, prior to breeding season; therefore, in the unlikely event that this species is in the vicinity during construction, no direct impacts would occur as a result of vegetation removal. Additionally, due to the very limited amount of breeding habitat adjacent to the Phase 1 project footprint, no indirect impacts to nesting cuckoos are expected due to noise or vibration during construction. If for any reason the project is delayed and vegetation removal must be conducted during the breeding season for this species, the Department's Project Coordinator will coordinate with the Department's Avian Monitoring Coordinator to conduct surveys and determine appropriate avoidance or minimization measures to ensure no adverse effects occur due to project activities.

STATE RECOMMENDATION

May affect, not likely to adversely affect

| | | |
|--------------------------------|--|-------------|
| Little Colorado Spinedace | <i>Lepidomeda vittata</i> | LT |
| Mexican Wolf | <i>Canis lupus baileyi</i> | LE,XN 10(j) |
| Southwestern Willow Flycatcher | <i>Empidonax traillii extimus</i> | LE |
| Yellow-billed Cuckoo | <i>Coccyzus americanus</i> (Western DPS) | LT |

Remarks:

The information in this Section 7 was gathered from:

- Arizona Game and Fish Department Heritage Data Management System
- Arizona Game and Fish Department. Unpublished abstracts compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ

| | | |
|----------------|---------------|---------------|
| Habitat Branch | Luke Thompson | 3/23/21 |
| Chief | _____ Name | _____ Date |

Arizona Environmental Online Review Tool Report



Arizona Game and Fish Department Mission

To conserve Arizona's diverse wildlife resources and manage for safe, compatible outdoor recreation opportunities for current and future generations.

Project Name:

Becker Lake Wildlife Area Restoration Project

Project Description:

Wetland restoration project for the Becker Lake Wildlife Area

Project Type:

Habitat Conservation and Restoration, Wetland restoration/creation

Contact Person:

Farrah Dang

Organization:

Fred Phillips Consulting

On Behalf Of:

AZGFD

Project ID:

HGIS-11329

Please review the entire report for project type and/or species recommendations for the location information entered. Please retain a copy for future reference.

Disclaimer:

1. This Environmental Review is based on the project study area that was entered. The report must be updated if the project study area, location, or the type of project changes.
2. This is a preliminary environmental screening tool. It is not a substitute for the potential knowledge gained by having a biologist conduct a field survey of the project area. This review is also not intended to replace environmental consultation (including federal consultation under the Endangered Species Act), land use permitting, or the Departments review of site-specific projects.
3. The Departments Heritage Data Management System (HDMS) data is not intended to include potential distribution of special status species. Arizona is large and diverse with plants, animals, and environmental conditions that are ever changing. Consequently, many areas may contain species that biologists do not know about or species previously noted in a particular area may no longer occur there. HDMS data contains information about species occurrences that have actually been reported to the Department. Not all of Arizona has been surveyed for special status species, and surveys that have been conducted have varied greatly in scope and intensity. Such surveys may reveal previously undocumented population of species of special concern.
4. HabiMap Arizona data, specifically Species of Greatest Conservation Need (SGCN) under our State Wildlife Action Plan (SWAP) and Species of Economic and Recreational Importance (SERI), represent potential species distribution models for the State of Arizona which are subject to ongoing change, modification and refinement. The status of a wildlife resource can change quickly, and the availability of new data will necessitate a refined assessment.

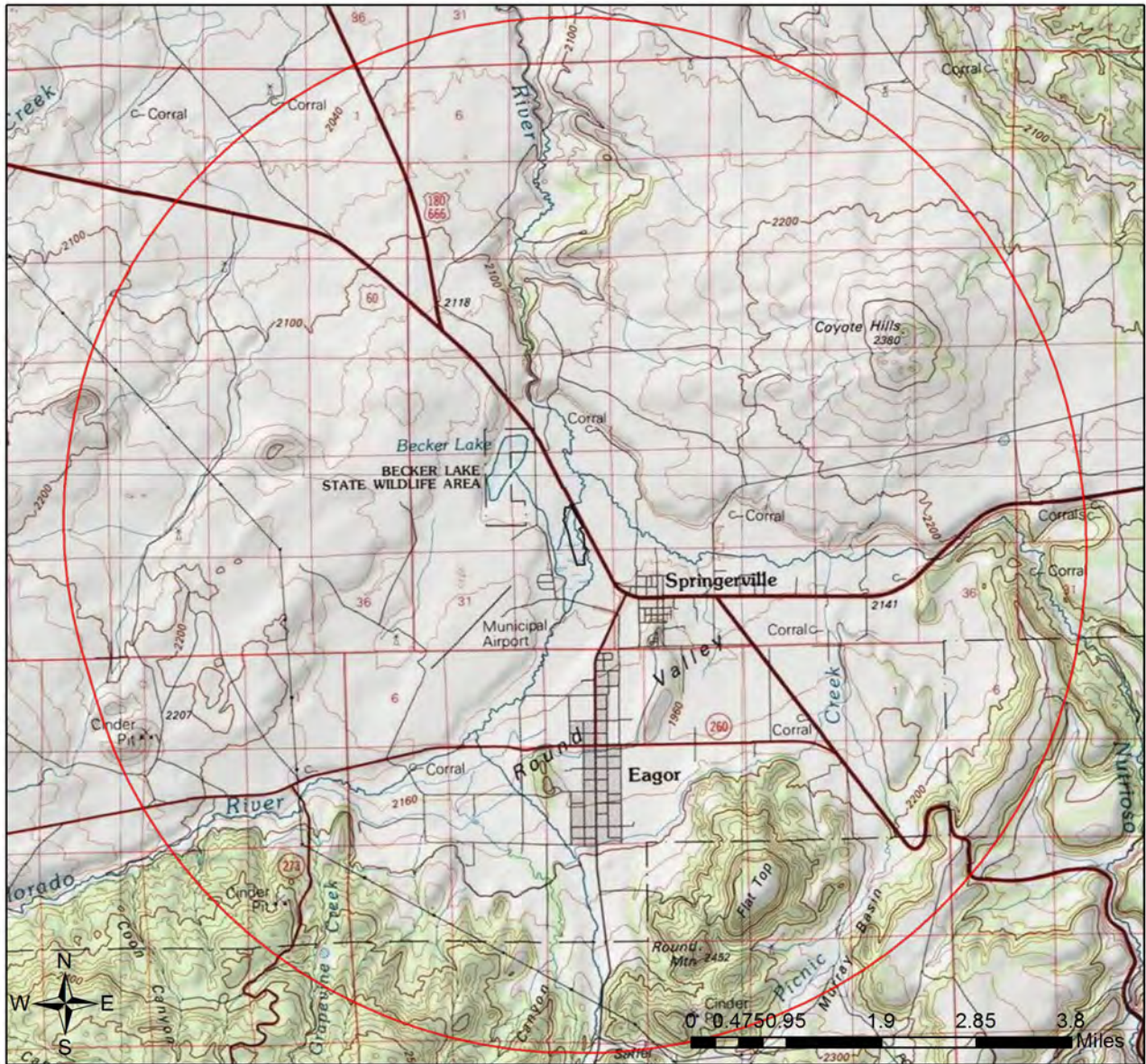
Locations Accuracy Disclaimer:



Project locations are assumed to be both precise and accurate for the purposes of environmental review. The creator/owner of the Project Review Report is solely responsible for the project location and thus the correctness of the Project Review Report content.

Recommendations Disclaimer:

1. The Department is interested in the conservation of all fish and wildlife resources, including those species listed in this report and those that may have not been documented within the project vicinity as well as other game and nongame wildlife.
2. Recommendations have been made by the Department, under authority of Arizona Revised Statutes Title 5 (Amusements and Sports), 17 (Game and Fish), and 28 (Transportation).
3. Potential impacts to fish and wildlife resources may be minimized or avoided by the recommendations generated from information submitted for your proposed project. These recommendations are preliminary in scope, designed to provide early considerations on all species of wildlife.
4. Making this information directly available does not substitute for the Department's review of project proposals, and should not decrease our opportunity to review and evaluate additional project information and/or new project proposals.
5. Further coordination with the Department requires the submittal of this Environmental Review Report with a cover letter and project plans or documentation that includes project narrative, acreage to be impacted, how construction or project activity(s) are to be accomplished, and project locality information (including site map). Once AGFD had received the information, please allow 30 days for completion of project reviews. Send requests to:
Project Evaluation Program, Habitat Branch
Arizona Game and Fish Department
5000 West Carefree Highway
Phoenix, Arizona 85086-5000
Phone Number: (623) 236-7600
Fax Number: (623) 236-7366
Or
PEP@azgfd.gov
6. Coordination may also be necessary under the National Environmental Policy Act (NEPA) and/or Endangered Species Act (ESA). Site specific recommendations may be proposed during further NEPA/ESA analysis or through coordination with affected agencies

Becker Lake Wildlife Area Restoration Project USA Topo Basemap With Locator Map



-  Project Boundary
-  Buffered Project Boundary

Project Size (acres): 47.53

Lat/Long (DD): 34.1418 / -109.2940

County(s): Apache

AGFD Region(s): Pinetop

Township/Range(s): T9N, R29E

USGS Quad(s): SPRINGERVILLE

Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap



Becker Lake Wildlife Area Restoration Project

Web Map As Submitted By User



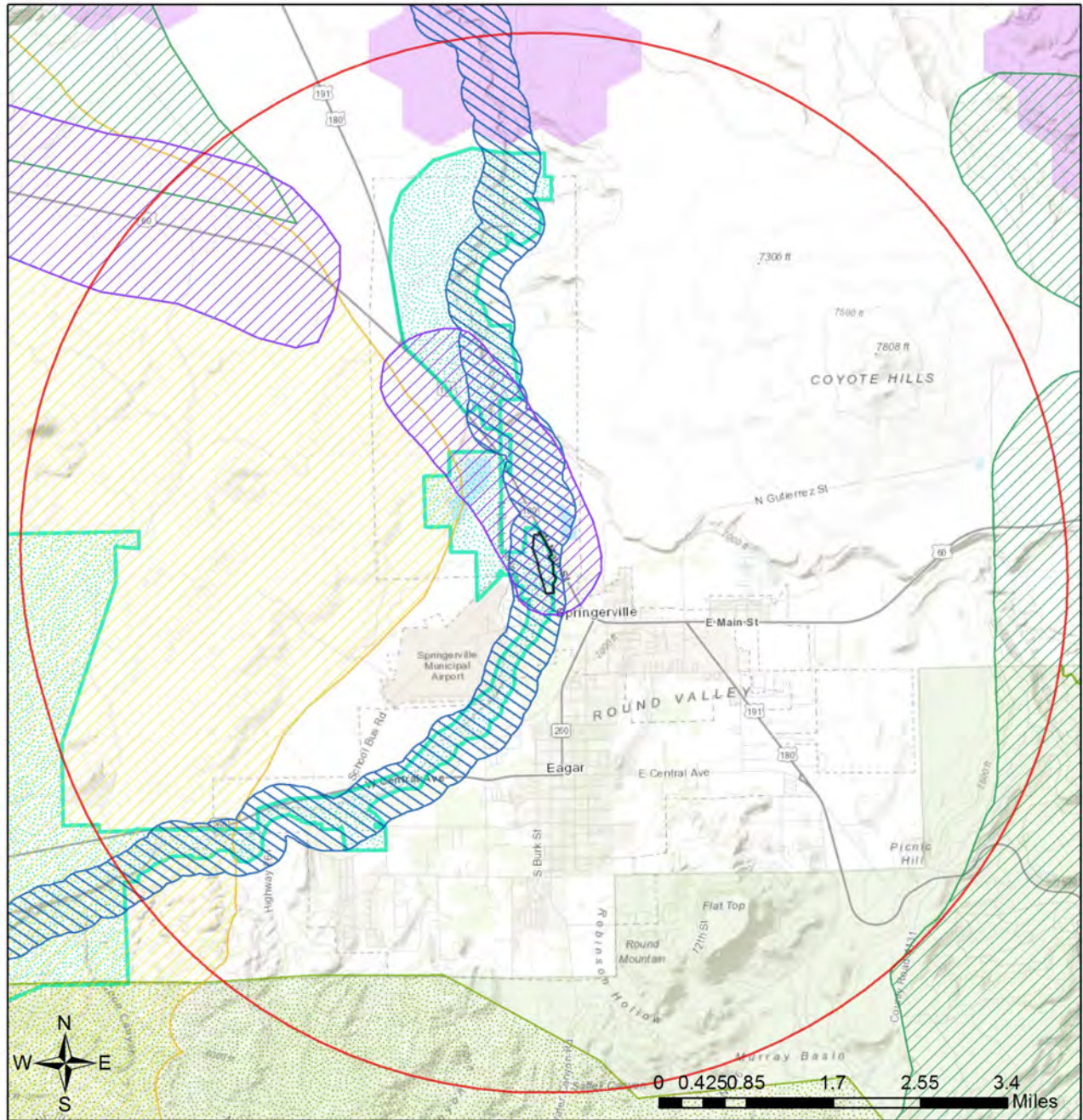
- Project Boundary
- Buffered Project Boundary
- Critical Habitat

Project Size (acres): 47.53
 Lat/Long (DD): 34.1418 / -109.2940
 County(s): Apache
 AGFD Region(s): Pinetop
 Township/Range(s): T9N, R29E
 USGS Quad(s): SPRINGERVILLE

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Becker Lake Wildlife Area Restoration Project

Important Areas



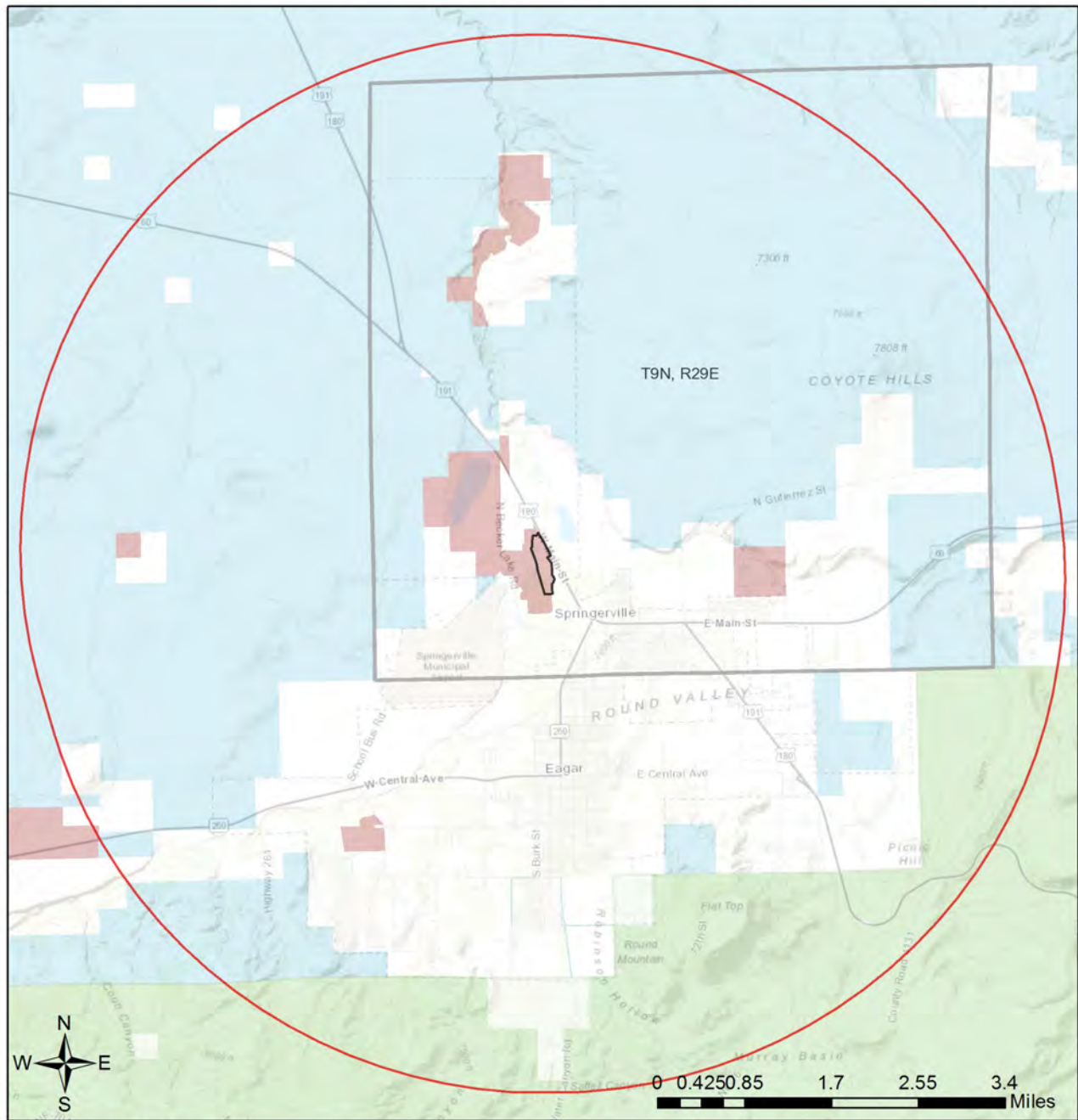
- | | |
|--------------------------------------|--|
| Project Boundary | Wildlife Movement Area - Riparian/Wash |
| Buffered Project Boundary | Wildlife Connectivity |
| County Stakeholder Assessment | Important Connectivity Zones |
| Wildlife Crossing Area | Pinal County Riparian |
| Wildlife Movement Area - Diffuse | Critical Habitat |
| Wildlife Movement Area - Landscape | Important Bird Areas |

Project Size (acres): 47.53
 Lat/Long (DD): 34.1418 / -109.2940
 County(s): Apache
 AGFD Region(s): Pinetop
 Township/Range(s): T9N, R29E
 USGS Quad(s): SPRINGERVILLE

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Becker Lake Wildlife Area Restoration Project

Township/Ranges and Land Ownership



- | | |
|---------------------------|------------------------|
| Project Boundary | Military |
| Buffered Project Boundary | Mixed/Other |
| Township/Ranges | National Park/Mon. |
| Land Ownership | |
| AZ Game & Fish Dept. | State & Regional Parks |
| BLM | State Trust |
| BOR | US Forest Service |
| Indian Res. | Wildlife Area/Refuge |
| | Private |

Project Size (acres): 47.53
 Lat/Long (DD): 34.1418 / -109.2940
 County(s): Apache
 AGFD Region(s): Pinetop
 Township/Range(s): T9N, R29E
 USGS Quad(s): SPRINGERVILLE

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Special Status Species Documented within 5 Miles of Project Vicinity

| Scientific Name | Common Name | FWS | USFS | BLM | NPL | SGCN |
|---|------------------------------------|---------|------|-----|-----|------|
| Anodonta californiensis | California Floater | SC | S | | | 1A |
| Aquila chrysaetos | Golden Eagle | BGA | | S | | 1B |
| Astragalus humistratus var. crispulus | Villous Ground-cover Milkvetch | | S | | | |
| Astragalus nutriosensis | Nutrioso Milk-vetch | SC | | | SR | |
| Athene cunicularia hypugaea | Western Burrowing Owl | SC | S | S | | 1B |
| Canis lupus baileyi | Mexican Wolf | LE,XN | | | | 1A |
| Catostomus discobolus discobolus | Bluehead Sucker | CCA | | S | | 1A |
| Catostomus sp. 3 | Little Colorado Sucker | CCA | S | S | | 1A |
| Charadrius montanus | Mountain Plover | SC | | | | 1B |
| Coccyzus americanus | Yellow-billed Cuckoo (Western DPS) | LT | S | | | 1A |
| Cynomys gunnisoni | Gunnison's Prairie Dog | SC | | S | | 1B |
| Dumetella carolinensis | Gray Catbird | | S | | | 1B |
| Haliaeetus leucocephalus (wintering pop.) | Bald Eagle - Winter Population | SC, BGA | S | S | | 1A |
| Haliaeetus leucocephalus | Bald Eagle | SC, BGA | S | S | | 1A |
| Lepidomeda vittata | Little Colorado Spinedace | LT | | | | 1A |
| Lithobates pipiens | Northern Leopard Frog | | S | S | | 1A |
| Perognathus flavus goodpasteri | Springerville Pocket Mouse | SC | S | | | 1B |

Note: Status code definitions can be found at <https://www.azgfd.com/wildlife/planning/wildlifeguidelines/statusdefinitions/>

Special Areas Documented within the Project Vicinity

| Scientific Name | Common Name | FWS | USFS | BLM | NPL | SGCN |
|---|---|-------|------|-----|-----|------|
| Canis lupus baileyi | 10J area Zone 2 for Mexican Wolf | LE,XN | | | | |
| Little Colorado River | Apache/Navajo Counties Wildlife Movement Area - Riparian/Wash | | | | | |
| US Highway 60: MP 386 | Apache/Navajo Counties Wildlife Crossing Area | | | | | |
| Upper Little Colorado River Watershed IBA | Important Bird Area | | | | | |

Note: Status code definitions can be found at <https://www.azgfd.com/wildlife/planning/wildlifeguidelines/statusdefinitions/>

Species of Greatest Conservation Need Predicted within the Project Vicinity based on Predicted Range Models

| Scientific Name | Common Name | FWS | USFS | BLM | NPL | SGCN |
|-------------------------|--------------------|-----|------|-----|-----|------|
| Accipiter gentilis | Northern Goshawk | SC | S | S | | 1B |
| Anaxyrus microscaphus | Arizona Toad | SC | | S | | 1B |
| Anodonta californiensis | California Floater | SC | S | | | 1A |

Species of Greatest Conservation Need Predicted within the Project Vicinity based on Predicted Range Models

| Scientific Name | Common Name | FWS | USFS | BLM | NPL | SGCN |
|---|--------------------------------|------------|------|-----|-----|------|
| <i>Antilocapra americana americana</i> | American Pronghorn | | | | | 1B |
| <i>Aquila chrysaetos</i> | Golden Eagle | BGA | | S | | 1B |
| <i>Baeolophus ridgwayi</i> | Juniper Titmouse | | | | | 1C |
| <i>Buteo swainsoni</i> | Swainson's Hawk | | | | | 1C |
| <i>Canis lupus baileyi</i> | Mexican Wolf | LE,XN | | | | 1A |
| <i>Castor canadensis</i> | American Beaver | | | | | 1B |
| <i>Catostomus latipinnis</i> | Flannelmouth Sucker | CCA | | S | | 1A |
| <i>Catostomus sp. 3</i> | Little Colorado Sucker | CCA | S | S | | 1A |
| <i>Charadrius montanus</i> | Mountain Plover | SC | | | | 1B |
| <i>Chordeiles minor</i> | Common Nighthawk | | | | | 1B |
| <i>Cinclus mexicanus</i> | American Dipper | | | | | 1B |
| <i>Coccythraustes vespertinus</i> | Evening Grosbeak | | | | | 1B |
| <i>Coluber constrictor mormon</i> | Western Yellow-bellied Racer | | | | | 1B |
| <i>Corynorhinus townsendii pallescens</i> | Pale Townsend's Big-eared Bat | SC | S | S | | 1B |
| <i>Cynomys gunnisoni</i> | Gunnison's Prairie Dog | SC | | S | | 1B |
| <i>Cyrtonyx montezumae</i> | Montezuma Quail | | | | | 1C |
| <i>Dumetella carolinensis</i> | Gray Catbird | | S | | | 1B |
| <i>Empidonax traillii extimus</i> | Southwestern Willow Flycatcher | LE | | | | 1A |
| <i>Empidonax wrightii</i> | Gray Flycatcher | | | | | 1C |
| <i>Euderma maculatum</i> | Spotted Bat | SC | S | S | | 1B |
| <i>Eugenes fulgens</i> | Rivoli's Hummingbird | | | | | 1B |
| <i>Falco peregrinus anatum</i> | American Peregrine Falcon | SC | S | S | | 1A |
| <i>Geothlypis tolmiei</i> | MacGillivray's Warbler | | | | | 1B |
| <i>Gymnorhinus cyanocephalus</i> | Pinyon Jay | | | S | | 1B |
| <i>Haliaeetus leucocephalus</i> | Bald Eagle | SC, BGA | S | S | | 1A |
| <i>Lepidomeda vittata</i> | Little Colorado Spinedace | LT | | | | 1A |
| <i>Lithobates pipiens</i> | Northern Leopard Frog | | S | S | | 1A |
| <i>Melospiza lincolni</i> | Lincoln's Sparrow | | | | | 1B |
| <i>Microtus longicaudus</i> | Long-tailed Vole | | | | | 1B |
| <i>Microtus montanus</i> | Montane Vole | | | | | 1B |
| <i>Mustela nigripes</i> | Black-footed Ferret | LE,XN | | | | 1A |
| <i>Myotis occultus</i> | Arizona Myotis | SC | | S | | 1B |
| <i>Myotis yumanensis</i> | Yuma Myotis | SC | | | | 1B |
| <i>Neotamias cinereicollis</i> | Gray-collared Chipmunk | | | | | 1B |
| <i>Neotoma stephensi</i> | Stephen's Woodrat | | | | | 1B |
| <i>Oncorhynchus apache</i> | Apache Trout | LT | | | | 1A |
| <i>Oreoscoptes montanus</i> | Sage Thrasher | | | | | 1C |
| <i>Panthera onca</i> | Jaguar | LE | | | | 1A |
| <i>Peromyscus nasutus</i> | Northern Rock Deermouse | | | | | 1B |

Species of Greatest Conservation Need Predicted within the Project Vicinity based on Predicted Range Models

| Scientific Name | Common Name | FWS | USFS | BLM | NPL | SGCN |
|---------------------------|---------------------------|-----|------|-----|-----|------|
| Rallus limicola | Virginia Rail | | | | | 1C |
| Rhinichthys osculus | Speckled Dace | SC | | S | | 1B |
| Sphyrapicus nuchalis | Red-naped Sapsucker | | | | | 1C |
| Spizella breweri | Brewer's Sparrow | | | | | 1C |
| Strix occidentalis lucida | Mexican Spotted Owl | LT | | | | 1A |
| Sturnella magna | Eastern Meadowlark | | | | | 1C |
| Tadarida brasiliensis | Brazilian Free-tailed Bat | | | | | 1B |

Species of Economic and Recreation Importance Predicted within the Project Vicinity

| Scientific Name | Common Name | FWS | USFS | BLM | NPL | SGCN |
|---------------------------------|--------------------|-----|------|-----|-----|------|
| Antilocapra americana americana | America Pronghorn | | | | | 1B |
| Callipepla squamata | Scaled Quail | | | | | 1C |
| Patagioenas fasciata | Band-tailed Pigeon | | | | | 1C |
| Zenaida macroura | Mourning Dove | | | | | |

Project Type: Habitat Conservation and Restoration, Wetland restoration/creation

Project Type Recommendations:

Minimize potential introduction or spread of exotic invasive species. Invasive species can be plants, animals (exotic snails), and other organisms (e.g., microbes), which may cause alteration to ecological functions or compete with or prey upon native species and can cause social impacts (e.g., livestock forage reduction, increase wildfire risk). The terms noxious weed or invasive plants are often used interchangeably. Precautions should be taken to wash all equipment utilized in the project activities before leaving the site. Arizona has noxious weed regulations (Arizona Revised Statutes, Rules R3-4-244 and R3-4-245). See Arizona Department of Agriculture website for restricted plants, <https://agriculture.az.gov/>. Additionally, the U.S. Department of Agriculture has information regarding pest and invasive plant control methods including: pesticide, herbicide, biological control agents, and mechanical control, <https://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/water/quality/?cid=stelprdb1044769> The Department regulates the importation, purchasing, and transportation of wildlife and fish (Restricted Live Wildlife), please refer to the hunting regulations for further information <https://www.azgfd.com/hunting/regulations>.

The Department's Landowner Relations Program works with the state's private landowners to promote and encourage incorporation of habitat creation and improvement for a variety of wildlife species. The program has grown significantly in recent years offering new alternatives and larger projects to all the cooperators. There are various options under this program to partner with the Department to enhance or restore wildlife habitat. To view specific program options and criteria, please refer to the following link: <https://www.azgfd.com/wildlife/landowners/>

Minimization and mitigation of impacts to wildlife and fish species due to changes in water quality, quantity, chemistry, temperature, and alteration to flow regimes (timing, magnitude, duration, and frequency of floods) should be evaluated. Minimize impacts to springs, in-stream flow, and consider irrigation improvements to decrease water use. If dredging is a project component, consider timing of the project in order to minimize impacts to spawning fish and other aquatic species (include spawning seasons), and to reduce spread of exotic invasive species. We recommend early direct coordination with Project Evaluation Program for projects that could impact water resources, wetlands, streams, springs, and/or riparian habitats.

Habitat restoration recommendations are dependant on habitat communities, target species, species located within the project area, site history, restoration goals, and treatment types. General project scoping should include defined project goals with measurable success criteria, site evaluation (e.g., soil conditions, local and watershed hydrological conditions and regimes), pre-project fish and wildlife surveys to determine project impacts and baseline data for post-project evaluation, established plan and methods for site preparation and revegetation (plant species evaluation based on current or expected site environmental conditions), consideration/incorporation of wildlife habitat features that may be secondary to project objectives (e.g., retaining snags for roost sites) and effects to habitat and wildlife at landscape scales (broader than project area), post-project monitoring plans and funding commitments, and an adaptive management plan. We recommend early coordination with Department personnel on project designs. Contact information can be found at <https://www.azgfd.com/Agency/Offices> or email our Project Evaluation Program at PEP@azgfd.gov

The Department recommends that wildlife surveys are conducted to determine if noise-sensitive species occur within the project area. Avoidance or minimization measures could include conducting project activities outside of breeding seasons.

Based on the project type entered, coordination with State Historic Preservation Office may be required (<http://azstateparks.com/SHPO/index.html>).

Consider incorporating project components that may allow for the inclusion to promote, enhance, create, or restore wildlife habitat. Contact Project Evaluation Program for further information and opportunities, PEP@azgfd.gov or (623) 236-7600 or <https://www.azgfd.com/agency/offices/>

Based on the project type entered, coordination with Arizona Department of Water Resources may be required (<https://new.azwater.gov/>).

Based on the project type entered, coordination with U.S. Army Corps of Engineers may be required (<http://www.usace.army.mil/>)

Project Location and/or Species Recommendations:

HDMS records indicate that one or more native plants listed on the **Arizona Native Plant Law and Antiquities Act** have been documented within the vicinity of your project area. Please contact:

Arizona Department of Agriculture
1688 W Adams St.
Phoenix, AZ 85007
Phone: 602.542.4373

<https://agriculture.az.gov/sites/default/files/Native%20Plant%20Rules%20-%20AZ%20Dept%20of%20Ag.pdf> starts on page 44

HDMS records indicate that one or more **Listed, Proposed, or Candidate** species or **Critical Habitat** (Designated or Proposed) have been documented in the vicinity of your project. The Endangered Species Act (ESA) gives the US Fish and Wildlife Service (USFWS) regulatory authority over all federally listed species. Please contact USFWS Ecological Services Offices at <http://www.fws.gov/southwest/es/arizona/> or:

Phoenix Main Office
9828 North 31st Avenue #C3
Phoenix, AZ 85051-2517
Phone: 602-242-0210
Fax: 602-242-2513

Tucson Sub-Office
201 N. Bonita Suite 141
Tucson, AZ 85745
Phone: 520-670-6144
Fax: 520-670-6155

Flagstaff Sub-Office
SW Forest Science Complex
2500 S. Pine Knoll Dr.
Flagstaff, AZ 86001
Phone: 928-556-2157
Fax: 928-556-2121

HDMS records indicate that **Western Burrowing Owls** have been documented within the vicinity of your project area. Please review the western burrowing owl resource page at:
<https://www.azgfd.com/wildlife/speciesofgreatestconservneed/burrowingowlmanagement/>.

The analysis has detected one or more **Important Bird Areas** within your project vicinity. Please see http://aziba.org/?page_id=38 for details about the Important Bird Area(s) identified in the report.

Analysis indicates that your project is located in the vicinity of an identified **wildlife habitat connectivity feature**. The **County-level Stakeholder Assessments** contain five categories of data (Barrier/Development, Wildlife Crossing Area, Wildlife Movement Area- Diffuse, Wildlife movement Area- Landscape, Wildlife Movement Area- Riparian/Washes) that provide a context of select anthropogenic barriers, and potential connectivity. The reports provide recommendations for opportunities to preserve or enhance permeability. Project planning and implementation efforts should focus on maintaining and improving opportunities for wildlife permeability. For information pertaining to the linkage assessment and wildlife species that may be affected, please refer to: <https://www.azgfd.com/wildlife/planning/habitatconnectivity/identifying-corridors/>. Please contact the Project Evaluation Program (pep@azgfd.gov) for specific project recommendations.





January 27, 2021

Ms. Kathryn Leonard
State Historic Preservation Officer
State Historic Preservation Office
1100 W Washington
Phoenix, AZ 85007

Re: **AZGFD-SHPO Consultation - Becker Lake Wildlife Area LCR Habitat Improvement Project / AGFD EAC #M21-0108105404**

Dear Ms. Leonard:

The Arizona Game and Fish Department (AZGFD) is consulting with your office regarding the above mentioned project located in Apache County, Arizona.

The proposed project is located in T9N, R29E, Sections 29 and 32, Gila and Salt River Meridian. The Area of Potential Effects (APE) consists of approximately 47.5 acres located on the Becker Lake Wildlife Area (BLWA) on land administered by the Department. Funding will be provided by the State of Arizona. Because proposed undertakings will utilize state funding on AZGFD land, the project is subject to compliance under the guidelines of the State of Arizona per the Arizona State Historic Preservation Act (SHPA), A.R.S. §41-861 et seq., and the Arizona Antiquities Act (AAA).

Proposed Project

The proposed undertaking consists of a 47.5-acre habitat improvement project within the Little Colorado River (LCR) riparian corridor in BLWA. The total length of the project runs approximately 6,400 linear feet along the LCR. Phase 1 activities described below are those that can occur outside of jurisdictional waters, thus not requiring an Army Corps of Engineers 404 permit. The AZGFD acknowledges that additional consultation may be required for Phase 2.

Habitat Improvement Demonstration Project - Phase 1

Project activities will fall into the following sub-phases: Site preparation, Earthworks, Stream and Floodplain Structures, and Trail Realignment. Construction activities are anticipated to take no longer than 10-16 weeks, and will be conducted by a combination of contractors and Department personnel. Large equipment will be mobilized and stationed at the current River Walk parking lot onsite. All heavy equipment would be cleaned prior to construction to avoid introducing non-native invasive plants. All construction activities will be completed outside of the active breeding season for the Western yellow-billed cuckoo, unless a monitor is present.

Site Preparation

The footprint of earthwork cut/fill and to-be-installed structures, as designated on the plan, will be cleared mechanically (by excavators or backhoes) and by hand-held power tools such as chainsaws, weed whackers, and power brush cutters. Any undesirable, invasive plants found in the footprint of earthwork cut/fill and to-be-installed structures will be pulled, dug out, or mulched over to prevent regrowth and reduce competition with native plants to be planted. Cleared plant material shall be left on site and placed outside the river corridor in designated areas. Currently, AZGFD routinely controls for invasive plants such as Siberian elm, Russian olive, exotic common reed grass, and Musk thistle within the BLWA, but if any additional species are detected, they will be treated appropriately, and will be disposed of offsite if resprout from mulching could occur. Any cottonwood, willow, or other native trees and shrubs on site will be preserved, with the critical root zone delineated so that heavy machinery won't damage the specimens.

Earthworks

Earthworks will involve the recontouring for future reconnection of relic floodplain channels to the river, as well as the excavation of backwater wetlands to ease hydraulic pressure during flood events; all of these activities will occur outside of the Ordinary High Water Mark (OHWM) shown in red on Figures 6a and 6b. A low ground pressure excavator, or similar, will likely be used for these activities. The OHWM will be staked or marked then allowing all work to be conducted outside of the OHWM, see Figure 6c. The excavated soil from on site will be used for construction of floodplain benches/bars as shown in the preliminary drawings. The excavator will be used to create topographic/soil saturation variation and gradual sloping in the currently, relatively flat, featureless floodplain. Existing headcuts will also be reshaped, such that the steep vertical drops and resulting erosion and channel incision are reduced. Meanders will be carved along the riparian corridor in the project area; these forms will help dissipate the energy of the running water and allow gentle overflow onto the surrounding floodplains, further reducing future erosion. Pools and basins will also be excavated.

5,500 cubic yards of earth will be excavated into the existing floodplains to create connector swales. Another 500 cubic yards will be excavated to create floodplain channels. 1,200 cubic yards will be excavated for backwater channels. 1,800 cubic yards of earth will be excavated and shaped for banklines and pools. Finally, an irrigation ditch 790 ft long will be excavated on site (context). A Stormwater Pollution Prevention Plan (SWPPP) will be prepared by either Oxbow or the construction contractor; this plan will detail measures and Best Management Practices (BMP) to be implemented to prevent sedimentation into the existing channel, such as the installation of silt fence and other erosion control materials. Excavated material (i.e. spoils) will be stored onsite for use during the future Phase 2 to plug the existing channel.

Stream & Floodplain Structures

After earthwork is complete, floodplain structures will be constructed using a combination of rocks, logs, and other natural debris found on site. Floodplain structures to be built on site will include 3 riffles, 600 linear feet of bioengineered streambank benches, and 9 juniper log jams.

Reshaped headcuts, the inlets and outlets of new meander pools, and newly excavated basins and channels will be lined with rocks embedded into the soil to bolster erosion resistance while creating aquatic habitat. The log jams, constructed from woody debris, will be placed across the floodplain at the top of constructed bars and benches. These woody structures will provide habitat coverage, egg mass attachment points, and potential points for future beaver dam activity while also introducing hydraulic variation and flow convergence for scour pool creation.

Trail Realignment

To address the degradation of the existing river trail, a new river trail running approximately 2,500 feet will be constructed within the planned cottonwood gallery planting. A force plate compactor/mechanized tamper or similar will be used to flatten the graded trail. Weed fabric and the ¾ Minus gravel will be added and compacted to stabilize the dirt trail. Interpretive and other signage, benches, and safety fencing/railing associated with the trail will be placed along the new river trail as appropriate.

All native plantings will occur under Phase 2, once the current channel can be connected to the new alignment created during Phase 1.

Cultural Resource Considerations and Tribal Consultations

The entire APE has been surveyed for cultural resources/historic properties and the negative findings are reported in the Survey Report Summary Form (SRSF):

Jack W. Treichler, and Kevin Dickinson

*2020 Becker Lake Wildlife Area Archaeological Survey, Apache County, Arizona. ASM
Accession No. 2020-0350, Cornerstone Environmental Report No. CEC 20-123.*

According to the report no known archaeological sites or other historic properties are located within the APE. The SRSF will no doubt seem familiar, since your office recently reviewed the report and provided the AZGFD with concurrence on its adequacy (SHPO-2020-1663 [157068]). Several of the project specifications were still under review by AZGFD project proponents and the survey report was submitted to your office for concurrence on a recommendation of report adequacy in advance of the completed project proposal.

Based upon the above information, the AZGFD requests that SHPO concur with a recommendation of "No Historic Properties Affected" for this project. Like all Department activities, all aspects of the proposed project are subject to the standard discovery clause:

If any previously unidentified cultural resources (including human remains or cremations) are encountered during any aspect of this project, the crew should immediately stop work at that specific location, take steps to protect the discovery, and immediately call the Cultural Resource Compliance Manager at the Arizona Game and Fish Department at 623-236-7620 who will immediately contact the AZ SHPO in order to determine the appropriate treatment of the Discovery.

Please review the contents of this letter, the attached maps, photographs, and engineering designs, and let us know if you concur with these findings and recommendations. If you have any questions or concerns, please feel free to contact me by phone at 623-236-7620 or via email at aarnett@azgfd.gov at any time.

Sincerely,



Abraham Arnett
Cultural Resource Compliance Manager, Habitat Branch
Arizona Game and Fish Department

cc: Ginger Ritter, Project Evaluation Program Supervisor

No Historic Properties Affected

Mary-ellen wahl 3/5/21

Arizona State Historic Preservation Office



Figure 1. Location of Becker Lake Wildlife Area within the state.

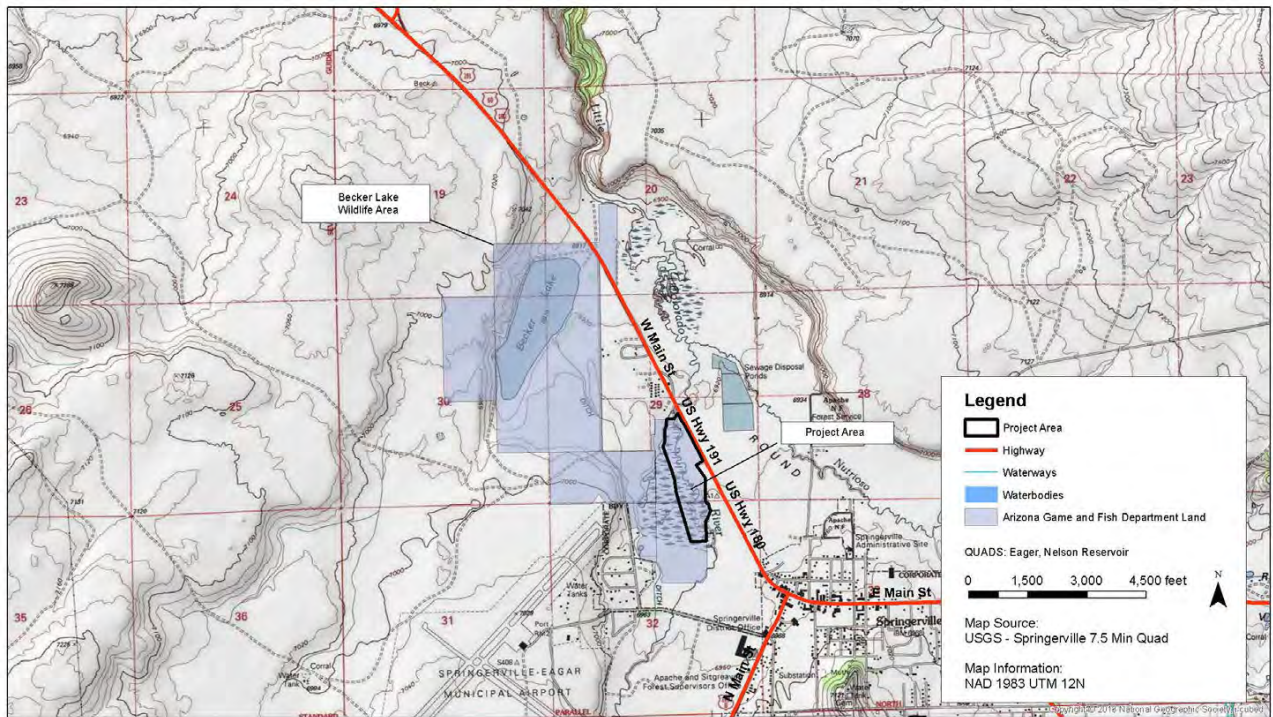
















Figure 2. Regional location of the Becker Lake WA habitat improvement project area.



Figure 3. Photo of project area along the Little Colorado River, facing south.



Figure 4. Relic floodplains channel network within the Little Colorado River floodplain.

| DIVISION 200: EARTHWORK | |
|---|---|
| - | Complete Site Preparation Activities |
|  | Floodplain Connector Swales: Excavate & Shape |
|  | Floodplain Channels: Re-Contour & Shape |
|  | Backwater Channels: Excavate & Shape |
|  | Streambank Soil Bioengineering: Excavate & Shape Bankline & Pools |
|  | Irrigation Ditch: Excavate |
|  | River Trail: Construct & Surface |
| DIVISION 300: STREAM & FLOODPLAIN STRUCTURES | |
|  | Constructed Riffles: Supply & Construct |
|  | Streambank Soil Bioengineering: Supply & Construct Toe Wood Bench |
|  | Beaver Dam Reinforcement & Repair: Supply & Construct |
|  | Log Jam: Supply & Construct |
| DIVISION 400: NATIVE PLANTINGS | |
|  | Supply & Plant Marsh Zone |
|  | Supply & Plant Riparian Sandbar Willow Zone |
|  | Supply & Plant Riparian Cottonwood & Willow Zone |
|  | Supply & Plant Pollinator Habitat Zone |

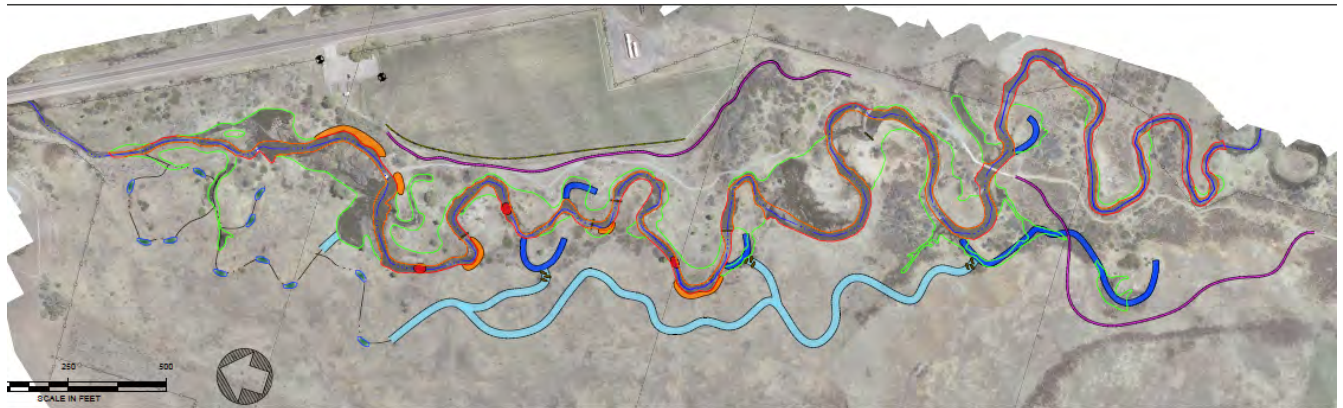


Figure 5. Becker Lake Demonstration Project Phase 1 & 2 (Phase 2 will be included in a separate consultation).

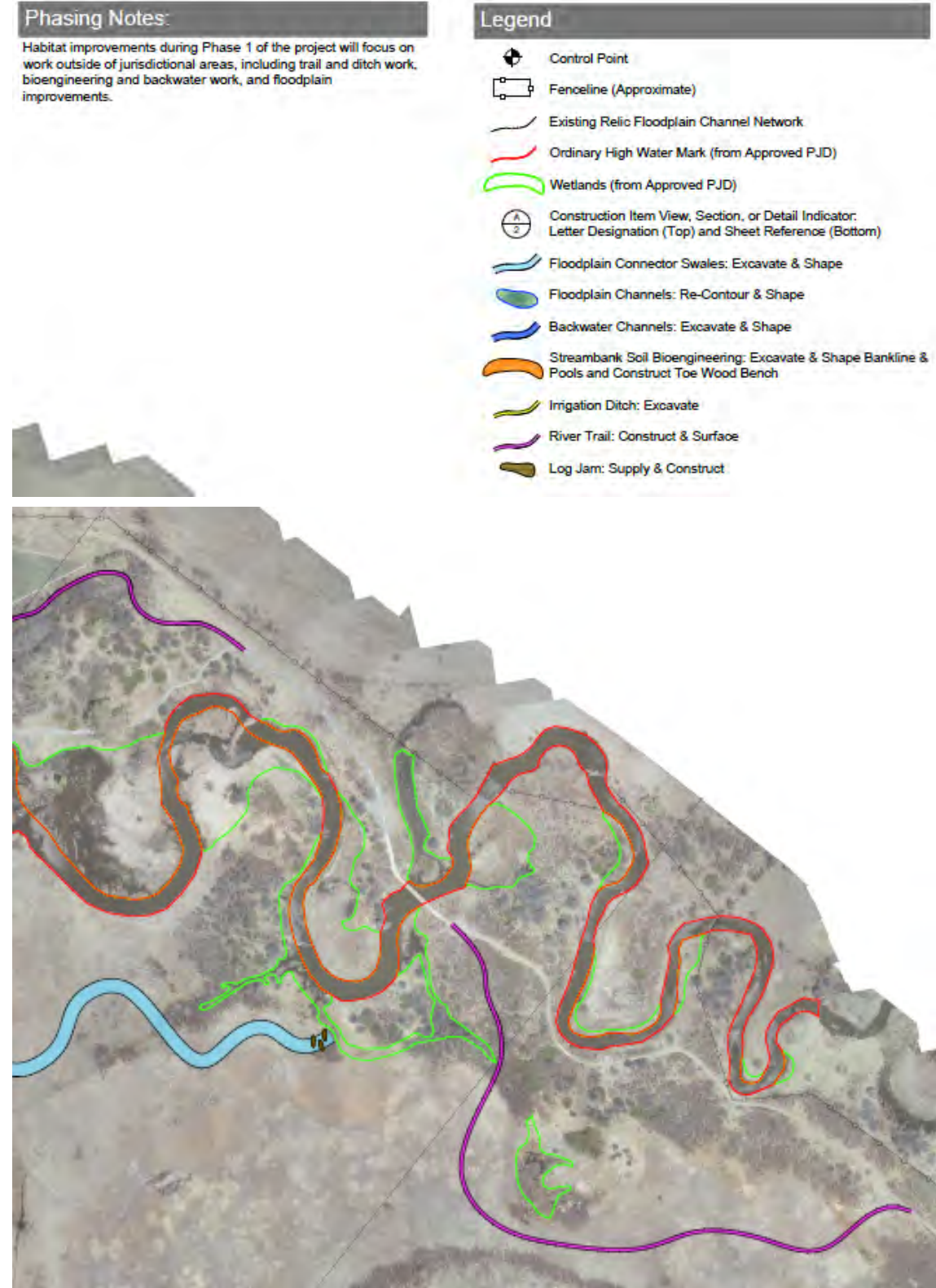


Figure 6a. Northern half of Becker Lake Demonstration Project Phase 1.

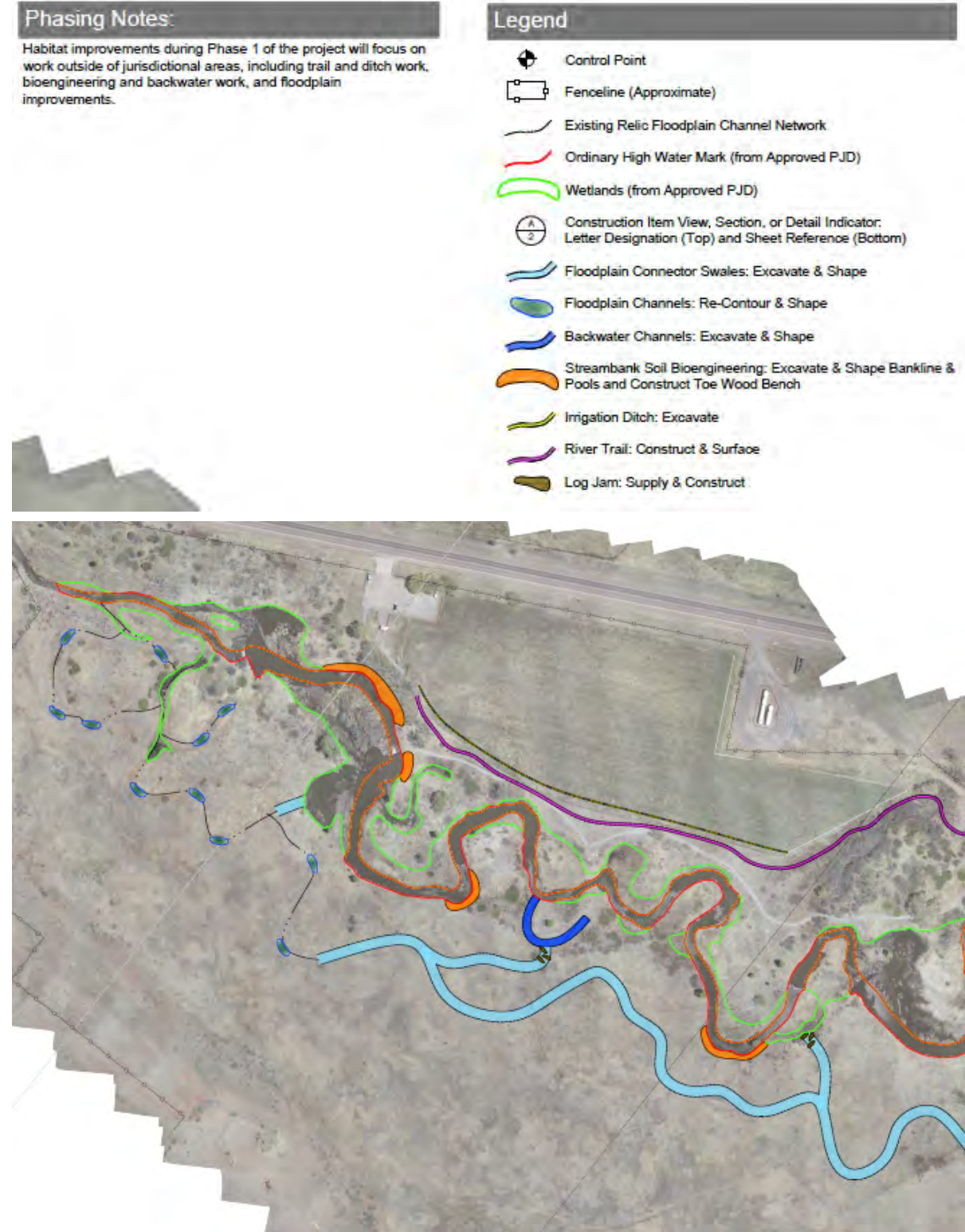


Figure 6b. Southern half of Becker Lake Demonstration Project Phase 1.

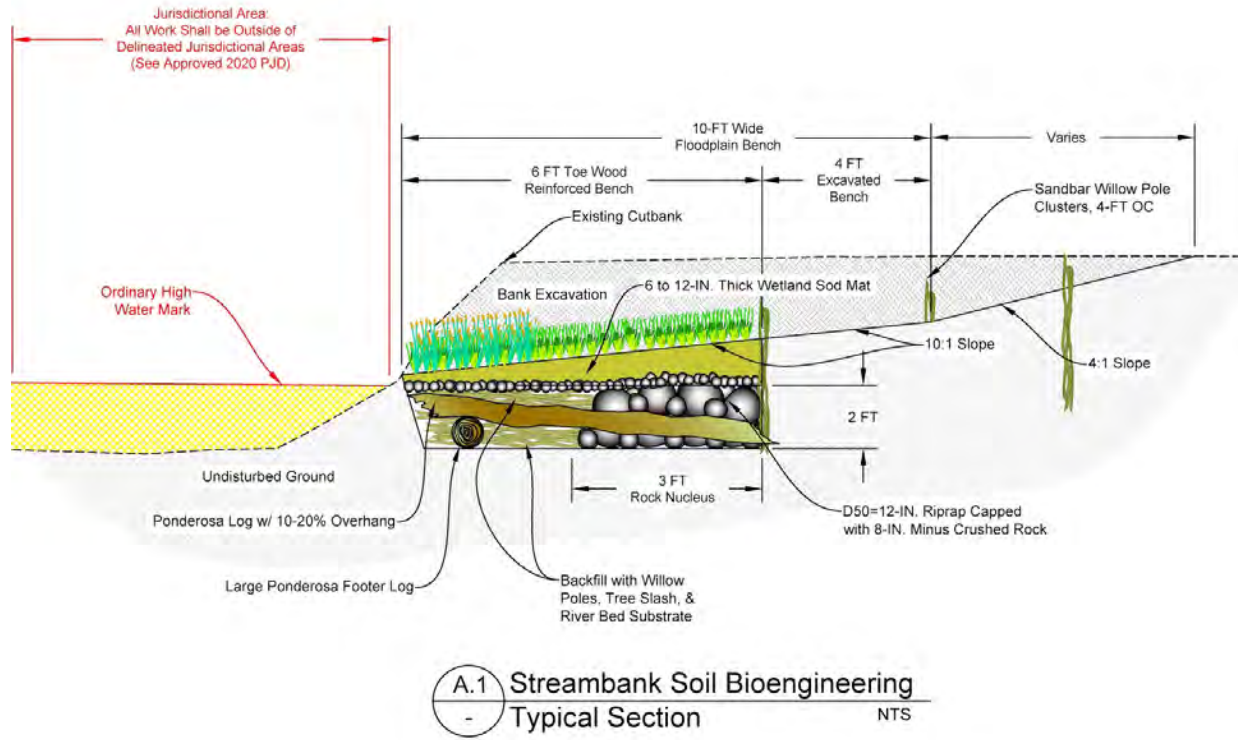


Figure 6c. OHWM avoidance during streambank soil bioengineering.

Becker Lake Wildlife Area Little Colorado River Habitat Improvement Project EAC Phasing Exhibit

Becker Lake Wildlife Area, Apache County, AZ
AGFD Order No. PO0000133003

PROJECT NAME:
Becker Lake Wildlife Area: Little Colorado River Habitat Improvement Project

LOCATION:
Becker Lake Wildlife Area
Apache County, AZ

PROJECT NUMBER:
AGFD17-182274-OXBOW
Order No. PO0000133003

PROJECT PHASE:
EAC Phasing Exhibit

CLIENT/PROJECT MANAGER:
 Arizona Game & Fish Department
5000 West Carefree Highway
Phoenix, AZ 85086
(602) 942-3000

NATIVE REVEGETATION DESIGN:
 Fred Phillips Consulting, LLC
401 South Leroux Street
Flagstaff, AZ 86001
(928) 773-1530

RESTORATION TECHNICAL ADVISOR:
 Watershed Artisans, Inc.
1000 Cordova Place #832
Santa Fe, NM, 87505
(505) 577-9625

DRAWN BY: G. Cathey
DESIGNED BY: NA

ENGINEER OF RECORD:

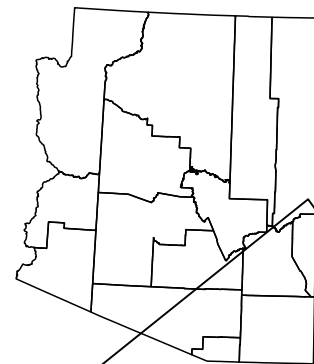
**PRELIMINARY
NOT FOR
CONSTRUCTION**

UNAUTHORIZED CHANGES & USES:
The engineer preparing these plans will not be responsible for, or liable for, unauthorized changes to or uses of these plans. All changes must be in writing and must be approved by the engineer of record.

PLAN REPRODUCTION:
The plans have been created on ANSI B (11 IN. x 17 IN.) sheets. For reductions, refer to graphic scale. The plans have been created for full color plotting. Any set of the plans that is not plotted in full color shall not be considered adequate. Warning: information may be lost in copying and/or gray scale plotting.



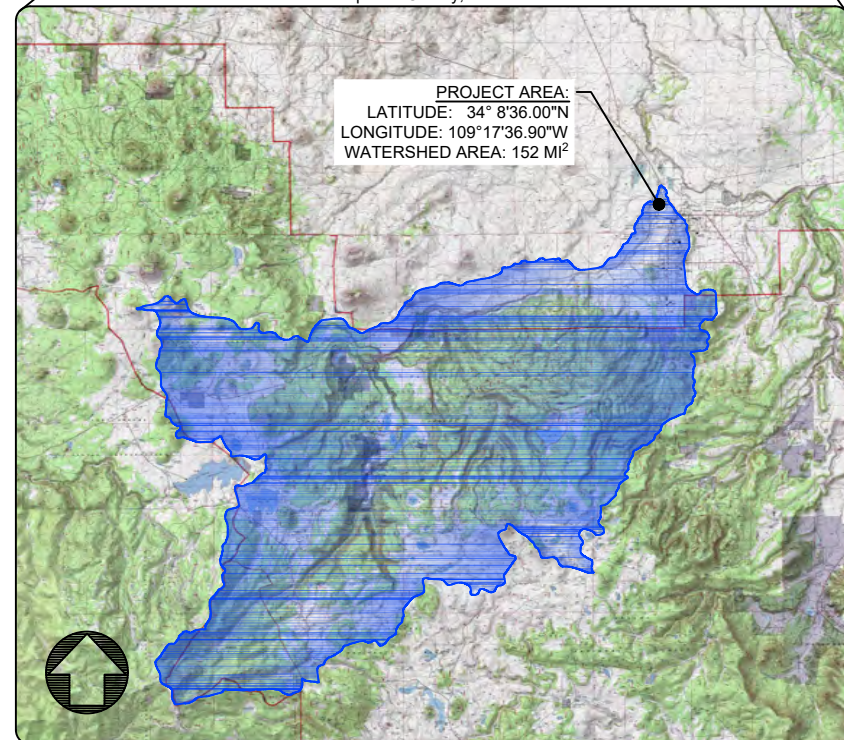
| | |
|--------------------------------|------------------------------------|
| DATE: 12.22.20 | OEE PROJECT #: AZ-009-03 |
| DRAWING: Cover Sheet | |
| DRAWING #: CVR01 | SHEET #: 1 OF 14 |
| REVISION #: | |



VICINITY & WATERSHED MAP
Gila-Salt River Meridian
Township 9N, Range 29E, Section 29 & 32
Apache County, Arizona



Beaver Dam Complex - Little Colorado River - UAS Photo by OEE, April 29, 2020



SHEET INDEX

| SHEET NUMBER | DRAWING NUMBER | DESCRIPTION |
|--------------|----------------|--|
| 1 | CVR01 | Cover Sheet |
| 2 | GEN01 | Assessment Briefing, Objectives, & References |
| 3 | GEN02 | Design Elements |
| 4 | HIP01 | Project Overview |
| 5 | HIP02 | Habitat Improvement Plan: Phase 1 |
| 6 | HIP03 | Habitat Improvement Plan: Phase 2 |
| 7 | HIP04 | Habitat Improvement Plan: Earthwork & Structure Details |
| 8 | VEG01 | Planting Plan: Phase 2 |
| 9 | VEG02 | Planting Plan: Typical Area |
| 10 | VEG03 | Planting Plan: Typical Section |
| 11 | VEG04 | Planting Details: Riparian Zone |
| 12 | VEG05 | Planting Details: Marsh Zone |
| 13 | VEG06 | Planting Details: Pollinator Habitat Zone |
| 14 | VEG07 | Planting Details: Deep Pot, Pole Planting, Microberm, & Schedule |

SUBMITTED TO



CLIENT:
Arizona Game & Fish Department
5000 West Carefree Highway
Phoenix, AZ 85086
(602) 942-3000

SUBMITTED BY



ENGINEERING DESIGN:
Oxbow Ecological Engineering, LLC
3491 S. Gillenwater Drive
Flagstaff, AZ 86005
(928) 266-6192



NATIVE REVEGETATION DESIGN:
Fred Phillips Consulting, LLC
401 South Leroux Street
Flagstaff, AZ 86001
(928) 773-1530



RESTORATION TECHNICAL ADVISOR:
Watershed Artisans, Inc.
1000 Cordova Place #832
Santa Fe, NM, 87505
(505) 577-9625

Assessment Briefing

The following is a brief assessment of the ~ 6,400-foot long study reach of the Lower Colorado River through Becker Lake Wildlife Area (see Drawing HIP01 for map):

- At least four meander banks within this stream channel reach have raw vertical/overhanging banks and partially formed lateral scour pools (A & B). The height of these banks relative to bankfull depth combined with steep bank angles, little or no root density or bank protection, and stratified bank soils creates a high potential for further bank erosion. Without intervention/stabilization efforts to address these impairments, these banks could become a significant source of non-point source sediment pollution.
- The river currently traverses the eastern edge of a wide, undeveloped meadow complex. The meadow has a series of relic channels directly adjacent to the river (Photo F), but it appears that the river has limited access to these floodplain channels during frequent flood flows. Reconnecting to these floodplain features could provide flood relief to spread and slow flows while also reducing shear stress on streambanks during frequent floods.
- Beaver activity is evident within the river corridor, with multiple large dam complexes throughout the site (Photo D, E, & F). These complexes provide multiple ecosystems services including: fish refugia, increased aquatic habitat heterogeneity, increased lateral connectivity to the floodplain, and increased area of inundation for groundwater water recharge and riparian vegetation health. The presence of the beaver and the services they provide will need to be considered in this habitat improvement plan and potentially future maintenance/management plans for the area.
- The popular "River Trail" that parallels the Little Colorado River through Becker Lake Wildlife Area provides access and viewing opportunities to the public. Currently there are multiple trail locations that have been damaged by natural river processes and beaver activity (Photo A & C). The current alignment may need to be re-evaluated to provide a buffer for these natural processes to play out while maintaining access and viewing opportunities.
- During the assessment, the agricultural field on the east side of the river was being flood irrigated and most of the tailwater was being routed directly to the river via a culvert (Photo A). Along with erosion at the culvert outlet, the tailwater had breached the ditch adjacent to the field and was flooding the trail and causing an active headcut to form on the trail edge/streambank interface (Photo C).
- Irrigation water is currently pumped from a sump created by a large beaver dam. Recent floods have breached this dam and have made it more difficult to pump from this diversion location (Photo D).
- There is relatively low density of riparian vegetation present within the corridor, other than a few patches of coyote willow and narrowleaf cottonwood planted in a previous restoration project in 2002/2006 (Photo B, E, & F).

Project Objectives

The overall objective is to improve morphological and ecological diversity of the Little Colorado River through Becker Lake Wildlife Area, to help build a resilient and sustaining riverscape. Specifically, the restoration objectives include:

- Reconnect relic floodplain channels and backwaters to increase the frequency of out-of-bank flows and reduce shear stress on streambanks throughout the river corridor.
- Decrease the Bank Erosion Potential (BEP) of cut-banks to reduce non-point point source sediment pollution and enhance aquatic habitat diversity.
- Increase the area of inundation at base flow to expand near stream wetland and backwater habitat
- Adjust the river trail alignment to provide a buffer for natural river processes, beaver activity, and agriculture, while maintaining access and viewing opportunities.
- Establish a mosaic of native plant species found naturally in the watershed to increase the area of wetland and riparian habitat.

Design Elements

Based on the inventory and habitat assessment for the project, the restoration team developed a set of site-specific practices that, if implemented holistically, could be used to meet the objectives outlined above. The following sheet includes examples of each restoration practice along with its potential impacts to the project objectives. The remainder of the sheets in this drawing set show the placement of these design elements within the stream corridor.

References

- Erosion Control Field Guide, 2013, Craig Sponholtz & Avery Anderson
- Field Guide to Forest & Mountain Plants in Northern Arizona, 2009, Judy Springer et al.
- Hydrodynamics and Sedimentology of Concave Benches, 2012, Geoff Vietz et al.
- Let the Water Do the Work, 2012, Bill Zeedyk & Van Clothier
- Little Colorado River Spinedace Recovery Plan, 1994, USFWS
- Little Colorado River Spinedace, Environmental Conservation Online System, USFWS
- Low-Tech Process Based Restoration of Riverscapes Design Manual, 2019, Joseph M. Wheaton et al.
- Methods for Estimating the Magnitude and Frequency of Floods in Arizona, 2014, USGS
- Regional Relationships for Bankfull Stage in Natural Channels of the Arid Southwest, 2003, Tom Moody et al.
- Streambank Soil Bioengineering (Part 654 National Engineering Handbook, Technical Supplement 141), 2007, NRCS.
- Streambank Soil Bioengineering Field Guide for Low Precipitation Areas, 2002, NRCS
- River Stability Field Guide, 2008, Dave Rosgen



A Cutbank, Irrigation Drainage, & Trail Damage



B Cutbank with High Bank Erosion Potential (BEP)



C Irrigation Drainage and Trail Flooding/Damage



D Beaver Dam Breach at Irrigation Point of Diversion



E Large Beaver Dam Complex



F Relic Floodplain Channel Network

PROJECT NAME:
Becker Lake Wildlife Area: Little Colorado River Habitat Improvement Project

LOCATION:
Becker Lake Wildlife Area
Apache County, AZ

PROJECT NUMBER:
AGFD17-182274-OXBOW
Order No. PO0000133003

PROJECT PHASE:
EAC Phasing Exhibit

CLIENT/PROJECT MANAGER:
Arizona Game & Fish Department
5000 West Carefree Highway
Phoenix, AZ 85086
(602) 942-3000

NATIVE REVEGETATION DESIGN:
Fred Phillips Consulting, LLC
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RESTORATION TECHNICAL ADVISOR:
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(505) 577-9625

DRAWN BY: G. Cathey

DESIGNED BY: G. Cathey

ENGINEER OF RECORD:

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UNAUTHORIZED CHANGES & USES:
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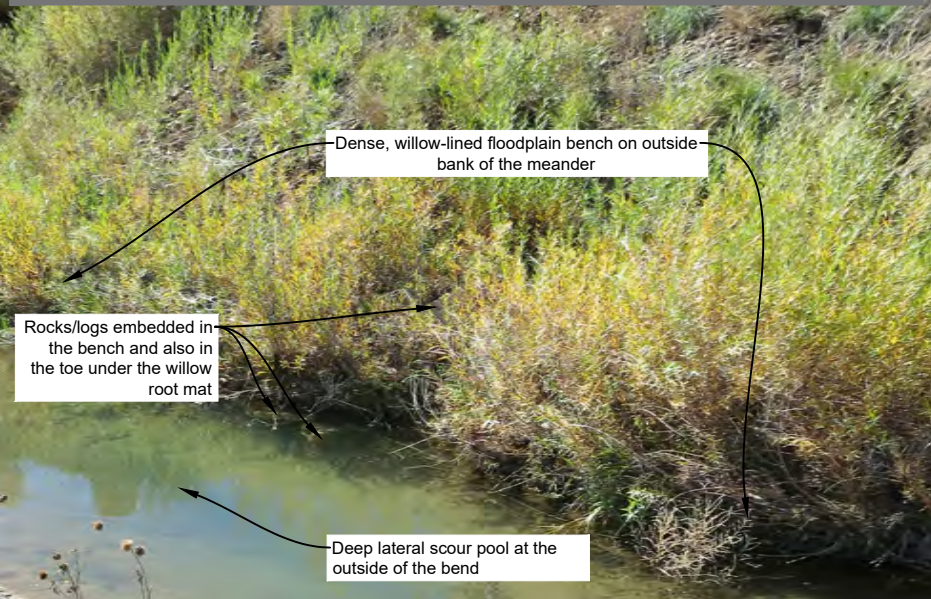
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811 Know what's below. Call before you dig.

DATE: 12.22.20 **OEE PROJECT #:** AZ-009-03

DRAWING:
Assessment Briefing, Objectives, & References

DRAWING #: GEN01 **SHEET #:** 2 OF 14 **REVISION #:**



1 Streambank Soil Bioengineering

Construct a floodplain bench at the outside of eroded meander bends to reduce bank erosion potential, add flood relief, and create a stable platform for dense riparian and wetland plantings. Strategically embed tow wood and graded rock within the bench and toe of slope to add erosion protection and protect native plantings. Excavate a deep lateral scour pool, as required, to help dissipate energy at the bend. Other benefits of these treatments include:

- Increase habitat and refugia for all life stages of LCRSD.
- Increase pool habitat and water depth variability.
- Increase habitat for a variety of aquatic and terrestrial macroinvertebrates, mammals, & birds.



2 Floodplain Connection

Reconnect, re-contour, and enhance a series of relic floodplain channels to help distribute and attenuate frequent flood flows (\pm 2-year events). Reconnect the river to these floodplain features with 12-15 foot wide swales with shallow side-slopes to provide flood relief and spread and slow flows while also reducing shear stress on streambanks during frequent floods. Shape existing relic channels as required to optimize floodplain and habitat function. Other benefits of these treatments include:

- Increase wetland and riparian habitat for a variety of aquatic and terrestrial macroinvertebrates, mammals, and birds.



3 Backwater Wetland Enhancement

Excavate shallow channels to connect and enhance existing saturated areas along the the river to improve habitat quality and complexity and provide flood relief.

- Increase habitat and refugia for all life stages of LCRSD.
- Increase emergent wetland habitat and saturated/nearly saturated soil conditions adjacent to perennial flowing water.
- Increase quiet backwater pool habitat and water depth variability.
- Increase habitat for a variety of aquatic and terrestrial macroinvertebrates.



4 Constructed Riffle

Embed graded rock and boulders into streambed to create a hardened riffle section at the tail-out of existing pool sections. This armored section is designed to increase water levels and the area of inundation of the adjacent pools, while providing grade control for the pool. Other benefits of these treatments include:

- Increase habitat and refugia for all life stages of LCRSD.
- Increase emergent wetland habitat and saturated/nearly saturated soil conditions adjacent to perennial flowing water.
- Increase quiet backwater pool habitat and water depth variability.
- Increase habitat for a variety of aquatic and terrestrial macroinvertebrates.



5 Woody Debris

Strategically place untreated wooden posts to reinforce smaller secondary beaver dams within the river corridor to reduce the likelihood of active dam failure during high flow events and extend the functional life of abandoned dams. Repair larger breached primary beaver dams with wooden posts, gravel, mud, and woody debris. Construct tree/slash log jams within floodplain channels to add roughness and slow flood flows. Other benefits of these treatments include:

- Increase habitat, cover, and refugia for all life stages of LCRSD.
- Increase emergent wetland habitat and saturated/nearly saturated soil conditions adjacent to perennial flowing water.
- Increase habitat for a variety of aquatic and terrestrial macroinvertebrates.
- Provide potential tie-in points for future beaver dam activity



6 Native Revegetation

Strategically plant a mosaic of native wetland and riparian vegetation to provide soil stabilization, cover, and habitat. Protect woody riparian species within small exclosures and/or tree tubes to prevent herbivory from beaver and deer. Other benefits of these treatments include:

- Increase cover for all life stages of LCRSD.
- Increase aquatic and terrestrial habitat heterogeneity.
- Increase habitat for a variety of aquatic and terrestrial macroinvertebrates, mammals, & birds.
- Increase woody vegetation to help support future beaver dam activity.

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river + riparian + wetland + wildland
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PROJECT NAME:
Becker Lake Wildlife Area: Little Colorado River Habitat Improvement Project

LOCATION:
Becker Lake Wildlife Area
Apache County, AZ

PROJECT NUMBER:
AGFD17-182274-OXBOW
Order No. PO0000133003

PROJECT PHASE:
EAC Phasing Exhibit

CLIENT/PROJECT MANAGER:
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Phoenix, AZ 85086
(602) 942-3000

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(928) 773-1530

RESTORATION TECHNICAL ADVISOR:
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(505) 577-9625

DRAWN BY: G. Cathey

DESIGNED BY: G. Cathey, C. Sponholtz

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DATE: 12.22.20 **OEE PROJECT #:** AZ-009-03

DRAWING: Design Elements

DRAWING #: GEN02 **SHEET #:** 3 OF 14 **REVISION #:**

PROJECT NAME:
Becker Lake Wildlife
Area: Little Colorado
River Habitat
Improvement Project

LOCATION:
Becker Lake
Wildlife Area
Apache County, AZ

PROJECT NUMBER:
AGFD17-182274-OXBOW
Order No. PO0000133003

PROJECT PHASE:
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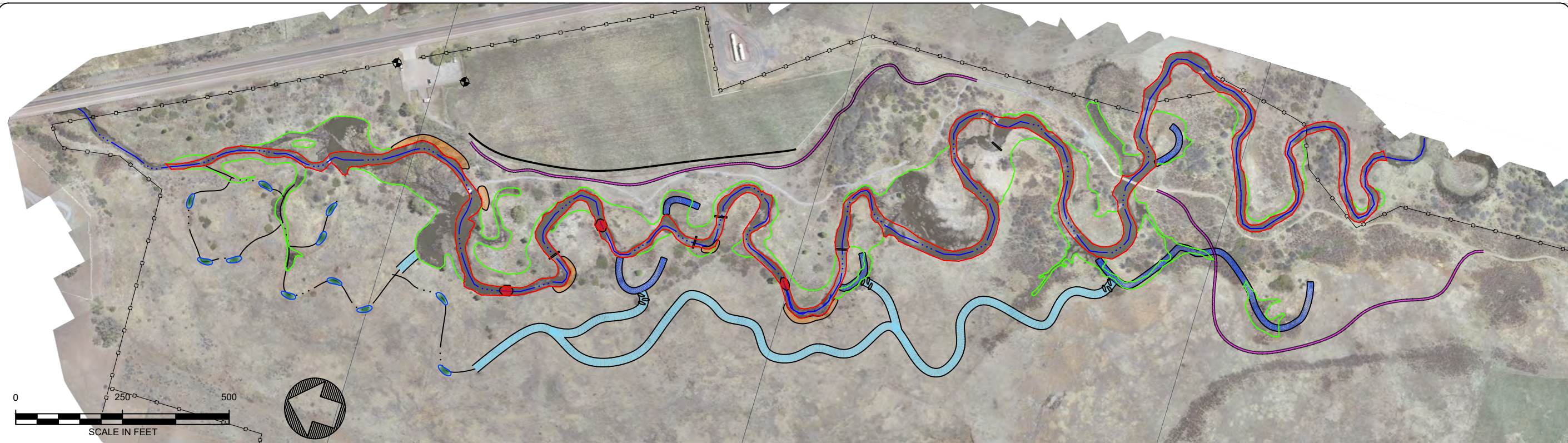
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DATE: 12.22.20 **OEE PROJECT #:** AZ-009-03

DRAWING: Project Overview

DRAWING #: HIP01 **SHEET #:** 4 OF 14 **REVISION #:**



Abbreviations

| | |
|--------|---------------------------------|
| @ | AT |
| AC | ACRE |
| APPROX | APPROXIMATELY |
| CC | CENTER TO CENTER |
| CL | CENTER LINE |
| CLF | CHIRICAHUA LEOPARD FROG |
| CP | CONTROL POINT |
| CY | CUBIC YARD |
| Ø | DIAMETER |
| DTL | DETAIL |
| DWG | DRAWING |
| EA | EACH |
| ELEV | ELEVATION |
| EX | EXISTING |
| FG | FINISHED GRADE ELEVATION |
| FL | FLOWLINE ELEVATION |
| FT | FEET |
| GB | GRADE BREAK |
| IN. | INCH |
| L | LENGTH |
| LCRSD | LITTLE COLORADO RIVER SPINEDACE |
| LF | LINEAR FEET |
| LS | LUMP SUM |
| MAX | MAXIMUM |
| M.E. | MATCH EXISTING |
| MIN | MINIMUM |
| MISC | MISCELLANEOUS |
| NMMJM | NEW MEXICO MEADOW JUMPING MOUSE |
| NO. | NUMBER |
| NTS | NOT TO SCALE |
| OC | ON CENTER |
| PROP. | PROPOSED |
| REQD | REQUIRED |
| SF | SQUARE FEET |
| SHT | SHEET |
| STA | STATION |
| W/ | WITH |

General Legend

| | |
|--|---|
| | Control Point |
| | Parcel Boundary/Fenceline (Approximate) |
| | Existing Little Colorado River Thalweg |
| | Existing Major Contour @ 5 Foot Interval |
| | Existing Minor Contour @ 1 Foot Interval |
| | Existing Relic Floodplain Channel Network |
| | Ordinary High Water Mark (from Approved PJD) |
| | Wetlands (from Approved PJD) |
| | Construction Item View, Section, or Detail Indicator: Letter Designation (Top) and Sheet Reference (Bottom) |

Construction Summary: Legend, Notes, & Estimated Quantities

| NOTE | SYMBOL | DESCRIPTION | QUANTITY | UNIT | DETAIL REFERENCE |
|---|--------|---|----------|------|---|
| DIVISION 100: GENERAL SPECIFICATIONS | | | | | |
| 103.1 | - | Fulfill General Requirements | 1 | LS | - |
| 104.1 | - | Mobilize & Demobilize Equipment | 1 | LS | - |
| DIVISION 200: EARTHWORK | | | | | |
| 201.1 | - | Complete Site Preparation Activities | 1 | LS | - |
| 202.1 | | Floodplain Connector Swales: Excavate & Shape | 5,500 | CY | $\frac{2}{3}$ $\frac{C-1}{7}$ |
| 202.2 | | Floodplain Channels: Re-Contour & Shape | 500 | CY | $\frac{2}{3}$ $\frac{D-1}{7}$ |
| 202.3 | | Backwater Channels: Excavate & Shape | 1,200 | CY | $\frac{3}{3}$ $\frac{E-1}{7}$ |
| 202.4 | | Streambank Soil Bioengineering: Excavate & Shape Bankline & Pools | 1,800 | CY | $\frac{1}{3}$ $\frac{A-1}{7}$ |
| 202.5 | | Irrigation Ditch: Excavate | 790 | LF | $\frac{F-1}{7}$ |
| 203.1 | | River Trail: Construct & Surface | 2,500 | LF | $\frac{F-1}{7}$ |
| DIVISION 300: STREAM & FLOODPLAIN STRUCTURES | | | | | |
| 301.1 | | Constructed Riffles: Supply & Construct | 3 | EA | $\frac{4}{3}$ $\frac{B-1}{7}$ $\frac{B-2}{7}$ |
| 302.1 | | Streambank Soil Bioengineering: Supply & Construct Toe Wood Bench | 600 | LF | $\frac{1}{3}$ $\frac{A-1}{7}$ |
| 303.1 | | Beaver Dam Reinforcement & Repair: Supply & Construct | 5 | EA | $\frac{5}{3}$ |
| 303.2 | | Log Jam: Supply & Construct | 9 | EA | $\frac{C-1}{7}$ |
| DIVISION 400: NATIVE PLANTINGS | | | | | |
| 400.1 | | Supply & Plant Marsh Zone | 1.0 | AC | See SHT 12 & 14 |
| 400.2 | | Supply & Plant Riparian Sandbar Willow Zone | 3.0 | AC | See SHT 11 & 14 |
| 400.3 | | Supply & Plant Riparian Cottonwood & Willow Zone | 5.0 | AC | See SHT 11 & 14 |
| 400.4 | | Supply & Plant Pollinator Habitat Zone | 0.5 | AC | See SHT 13 & 14 |

TABLE 1: Data Sources

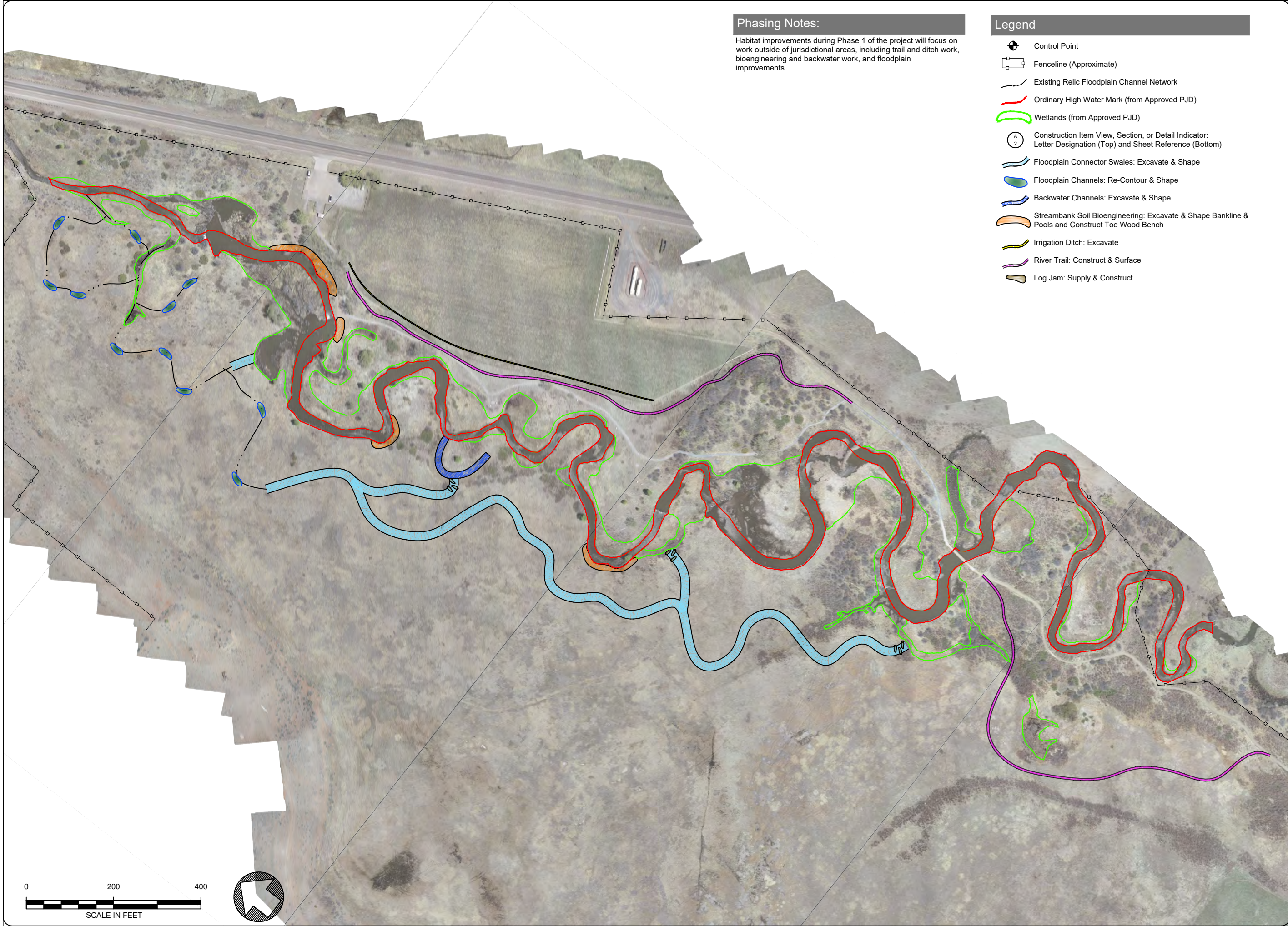
| NUMBER | TYPE | DATE | SOURCE | DESCRIPTION |
|--------|-----------------|--------|------------------------------|--|
| 1 | Aerial Imagery | 4/2020 | Oxbow Ecological Engineering | UAS derived digital orthoimagery |
| 2 | Topography | 4/2020 | Oxbow Ecological Engineering | Surface derived from UAS photogrammetric point cloud data |
| 3 | Topography | 6/2020 | Oxbow Ecological Engineering | Surface derived from supplemental RTK GPS survey |
| 4 | Parcel Boundary | NA | AGFD | SHP file, approximate, not the result of a boundary survey |

TABLE 2: Datum & Coordinate Projection Information

| | |
|-----------------------------|--------------------------------------|
| HORIZONTAL DATUM | NAD83(2011) |
| PROJECTED COORDINATE SYSTEM | ARIZONA STATE PLANE EAST ZONE (0201) |
| VERTICAL DATUM | NAVD88 |
| GEOID MODEL | GEOID18 (CONUS) |
| UNITS | INTERNATIONAL FEET |

TABLE 3: Control Points














| NUMBER | NORTHING | EASTING | ELEVATION | DESIGNATION | DESCRIPTION |
|--------|--------------|------------|-----------|-----------------------|---|
| 1 | 1,140,343.29 | 960,569.61 | 7,029.45 | PORT (PID ER0378) | AZ DOT BRASS MONUMENT |
| 2 | 1,140,338.06 | 960,534.40 | 7,029.28 | PORT RM2 (PID ER0379) | AZ DOT BRASS MONUMENT |
| 5 | 1,145,181.11 | 964,109.03 | 6,928.01 | CTCP OEE CAP | ORANGE PLASTIC CAP STAMPED WITH "OXBOW ECO ENG" |
| 6 | 1,145,016.16 | 964,111.61 | 6,928.80 | CTCP OEE CAP | ORANGE PLASTIC CAP STAMPED WITH "OXBOW ECO ENG" |
| 7 | 1,140,906.23 | 963,480.84 | 6,955.95 | CTCP OEE CAP | ORANGE PLASTIC CAP STAMPED WITH "OXBOW ECO ENG" |
| 8 | 1,140,712.19 | 963,713.70 | 6,963.46 | 121 (PID ER0377) | AZ HIGHWAY DEPT. BRASS MONUMENT |



Phasing Notes:

Habitat improvements during Phase 1 of the project will focus on work outside of jurisdictional areas, including trail and ditch work, bioengineering and backwater work, and floodplain improvements.

Legend

-  Control Point
-  Fenceline (Approximate)
-  Existing Relic Floodplain Channel Network
-  Ordinary High Water Mark (from Approved PJD)
-  Wetlands (from Approved PJD)
-  Construction Item View, Section, or Detail Indicator:
Letter Designation (Top) and Sheet Reference (Bottom)
-  Floodplain Connector Swales: Excavate & Shape
-  Floodplain Channels: Re-Contour & Shape
-  Backwater Channels: Excavate & Shape
-  Streambank Soil Bioengineering: Excavate & Shape Bankline & Pools and Construct Toe Wood Bench
-  Irrigation Ditch: Excavate
-  River Trail: Construct & Surface
-  Log Jam: Supply & Construct


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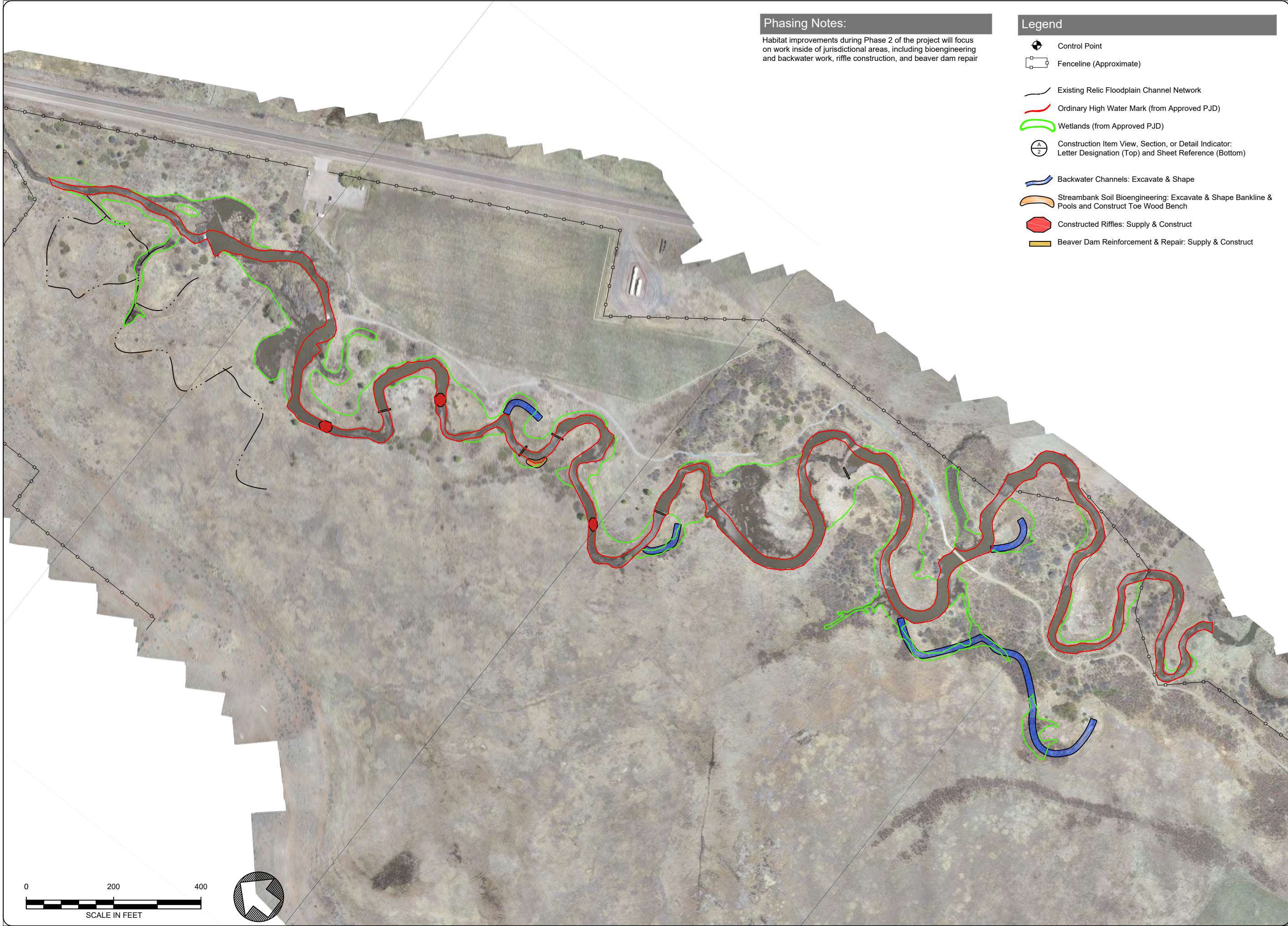


DATE: 12.22.20 **OEE PROJECT #:** AZ-009-03

DRAWING:
Habitat Improvement Plan:
Phase 1

DRAWING #: HIP02 **SHEET #:** 5 OF 14 **REVISION #:**





Phasing Notes:

Habitat improvements during Phase 2 of the project will focus on work inside of jurisdictional areas, including bioengineering and backwater work, riffle construction, and beaver dam repair

Legend

- Control Point
- Fenceline (Approximate)
- Existing Relic Floodplain Channel Network
- Ordinary High Water Mark (from Approved PJD)
- Wetlands (from Approved PJD)
- Construction Item View, Section, or Detail Indicator: Letter Designation (Top) and Sheet Reference (Bottom)
- Backwater Channels: Excavate & Shape
- Streambank Soil Bioengineering: Excavate & Shape Bankline & Pools and Construct Toe Wood Bench
- Constructed Riffles: Supply & Construct
- Beaver Dam Reinforcement & Repair: Supply & Construct

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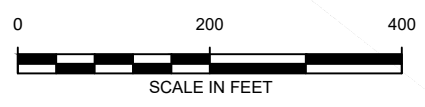
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DATE: 12.22.20 **OEE PROJECT #:** AZ-009-03

DRAWING:
Habitat Improvement Plan:
Phase 2

| | | |
|----------------------------|----------------------------|--------------------|
| DRAWING #: HIP03 | SHEET #: 6 OF 14 | REVISION #: |
|----------------------------|----------------------------|--------------------|



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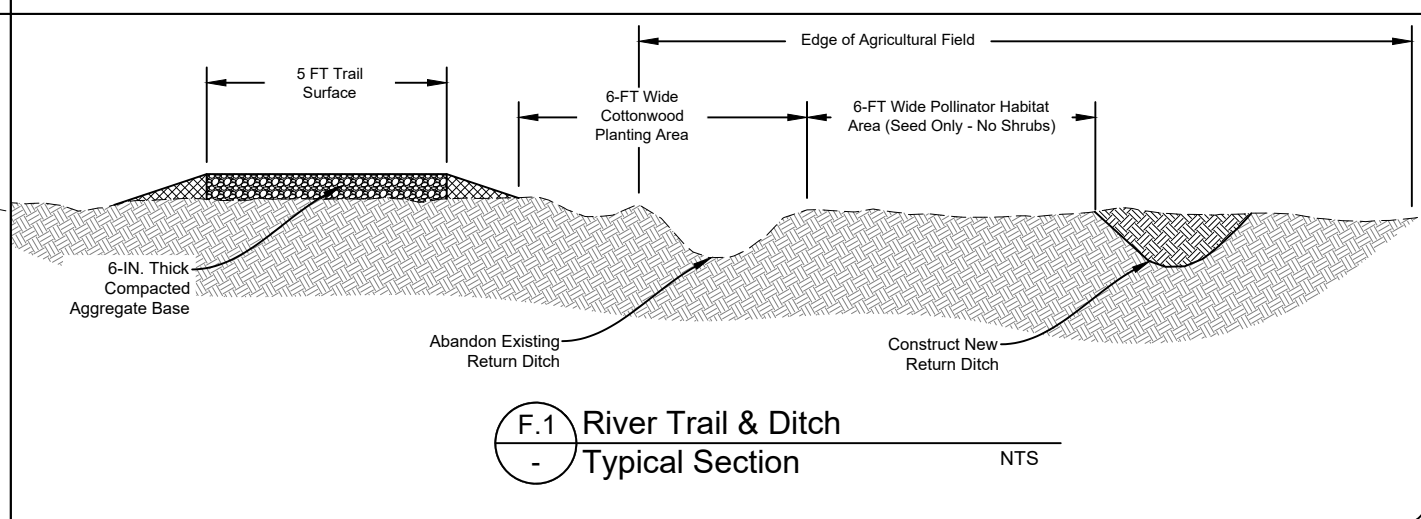
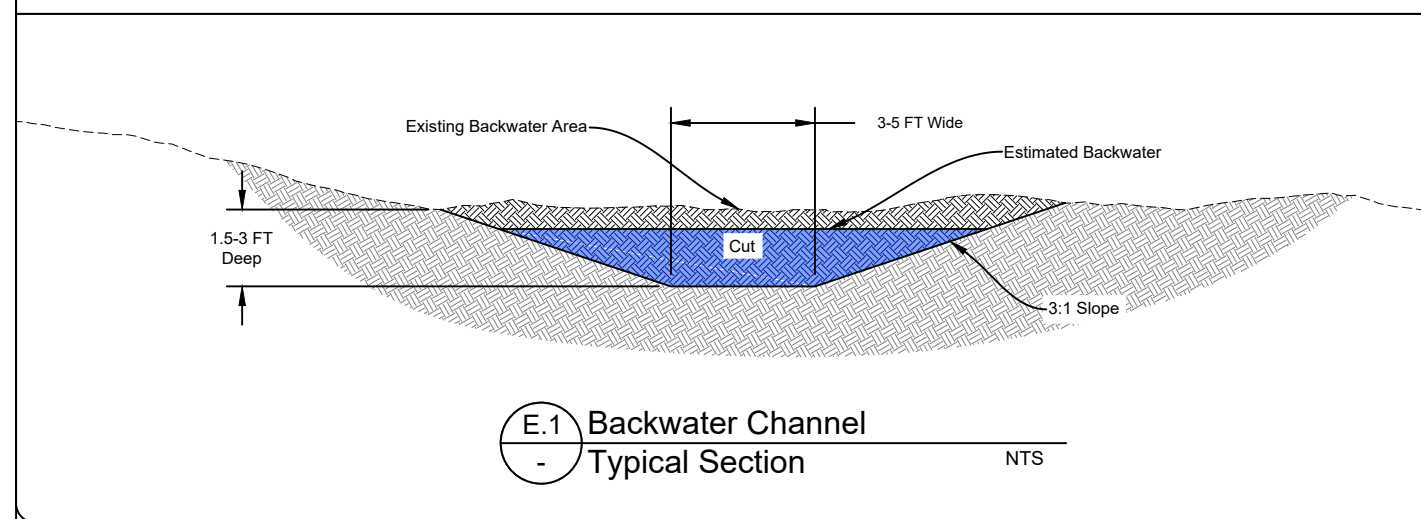
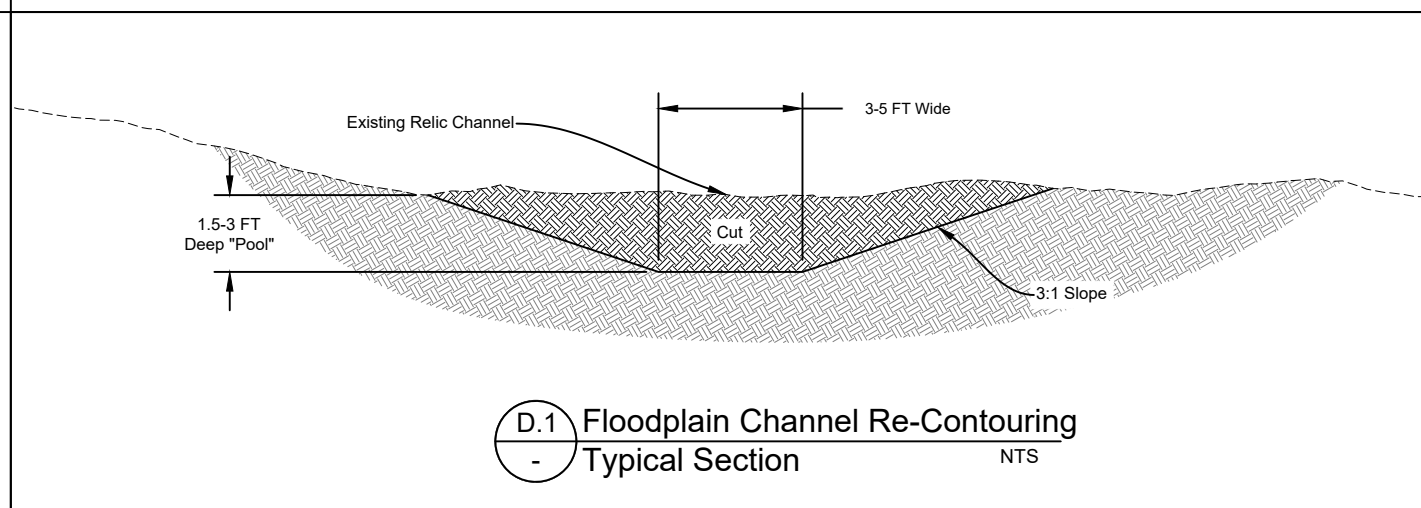
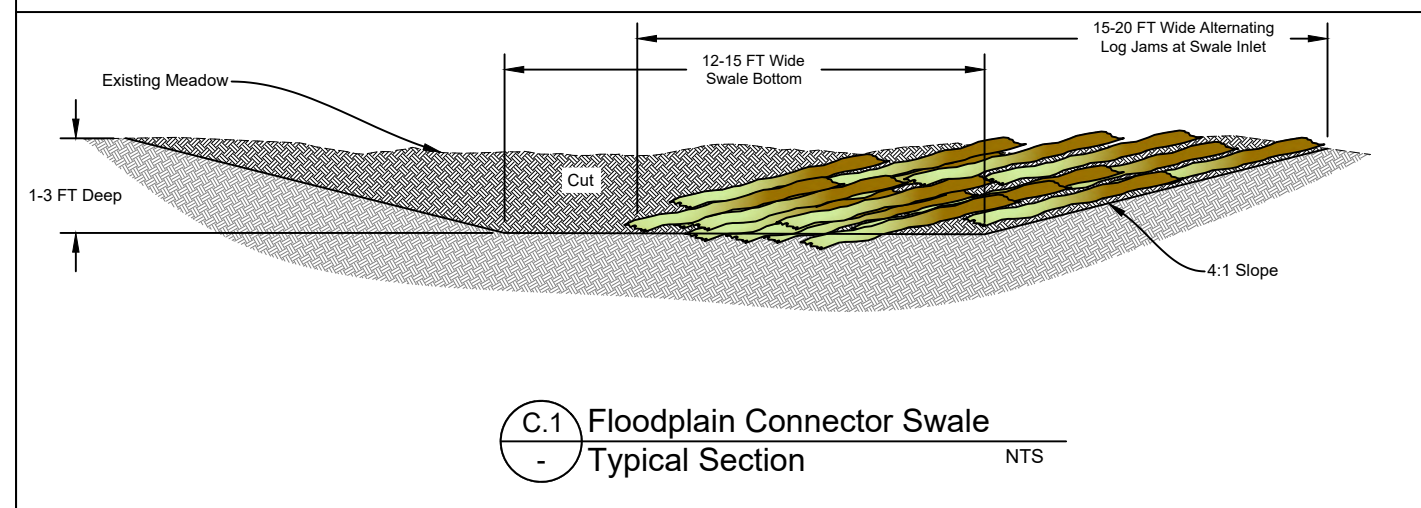
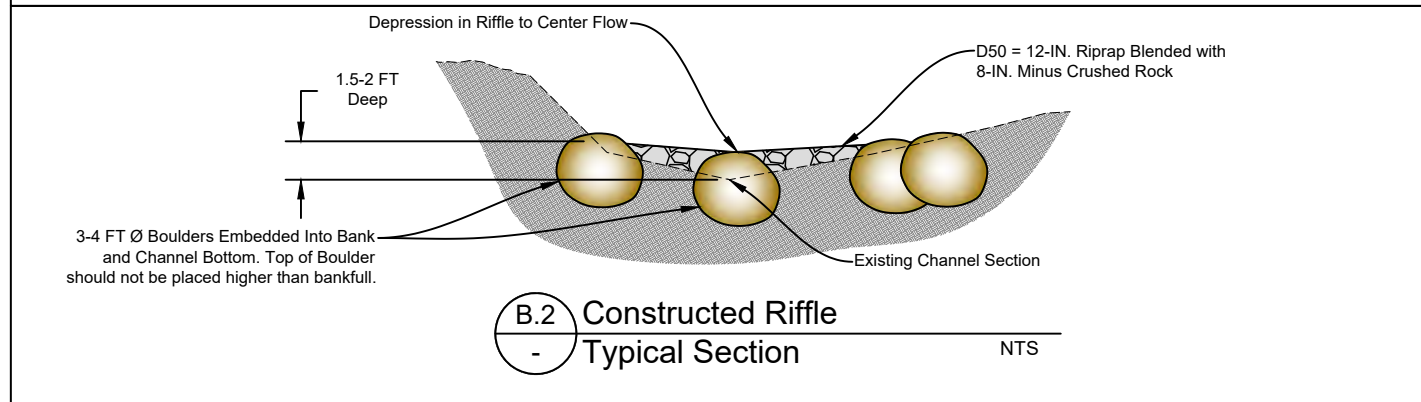
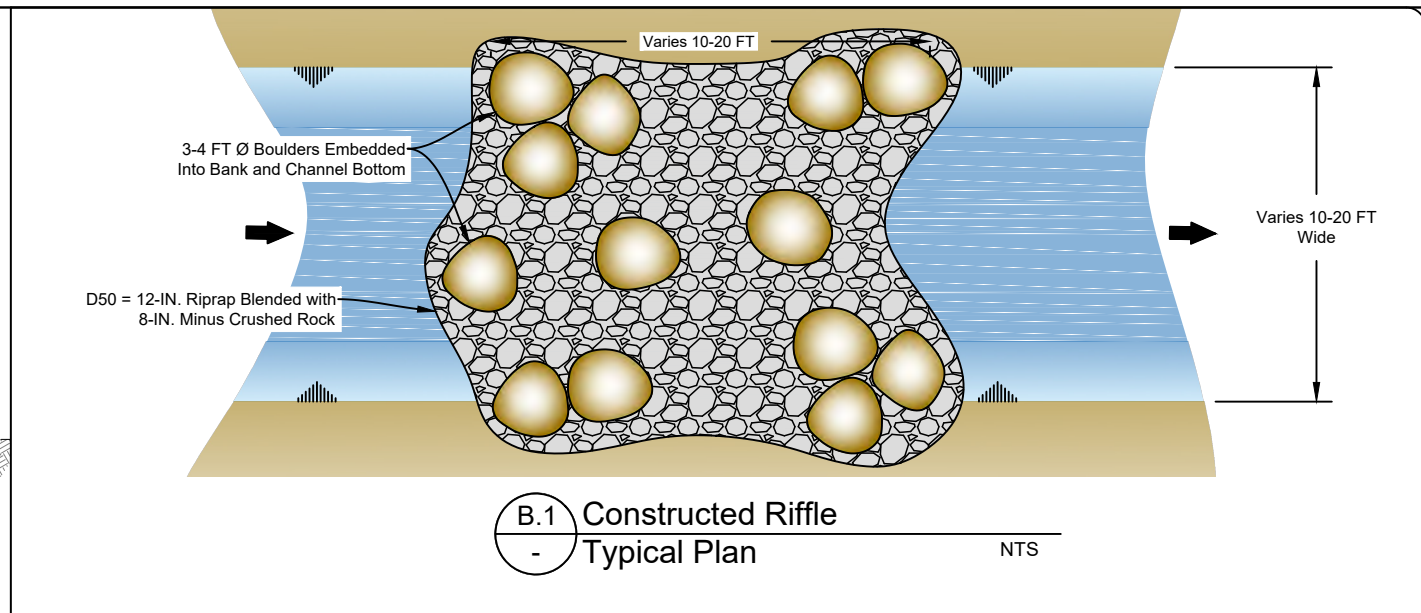
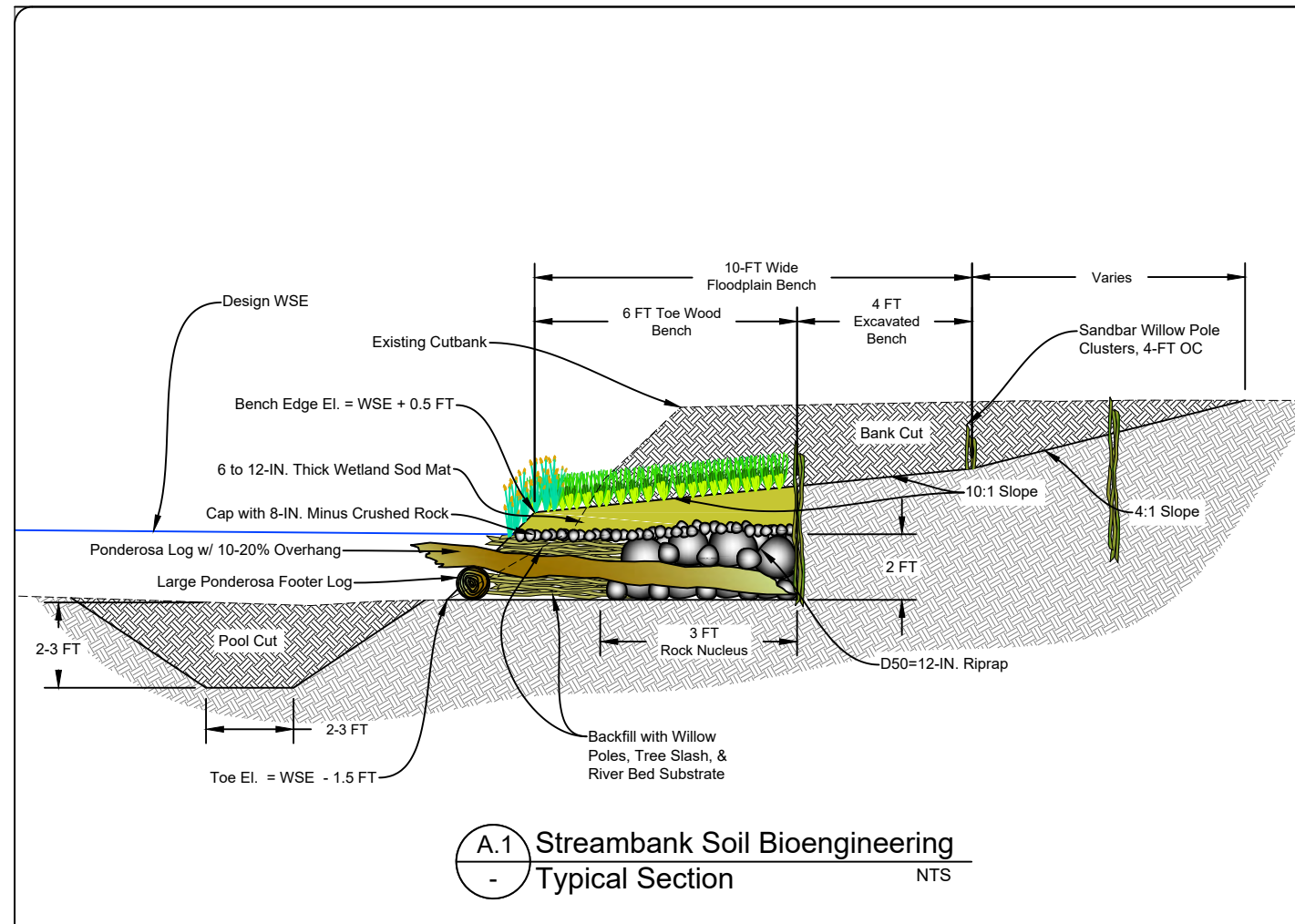
PLAN REPRODUCTION:
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DATE: 12.22.20 **OEE PROJECT #:** AZ-009-03

DRAWING:
Habitat Improvement Plan:
Earthwork & Structure Details

DRAWING #: HIP04 **SHEET #:** 7 OF 14 **REVISION #:**



PROJECT NAME:
Becker Lake Wildlife Area: Little Colorado River Habitat Improvement Project

LOCATION:
Becker Lake Wildlife Area
Apache County, AZ

PROJECT NUMBER:
AGFD17-182274-OXBOW
Order No. PO0000133003

PROJECT PHASE:
EAC Phasing Exhibit

CLIENT/PROJECT MANAGER:
Arizona Game & Fish Department
5000 West Carefree Highway
Phoenix, AZ 85086
(602) 942-3000

NATIVE REVEGETATION DESIGN:
Fred Phillips Consulting, LLC
401 South Leroux Street
Flagstaff, AZ 86001
(928) 773-1530

RESTORATION TECHNICAL ADVISOR:
Watershed Artisans, Inc.
1000 Cordova Place #832
Santa Fe, NM, 87505
(505) 577-9625

DRAWN BY: G. Cathey

DESIGNED BY: G. Cathey, F. Phillips

ENGINEER OF RECORD:

**PRELIMINARY
NOT FOR
CONSTRUCTION**

UNAUTHORIZED CHANGES & USES:
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DATE: 12.22.20 **OEE PROJECT #:** AZ-009-03

DRAWING:
Planting Plan:
Phase 2












DRAWING #: VEG01 **SHEET #:** 8 OF 14 **REVISION #:**

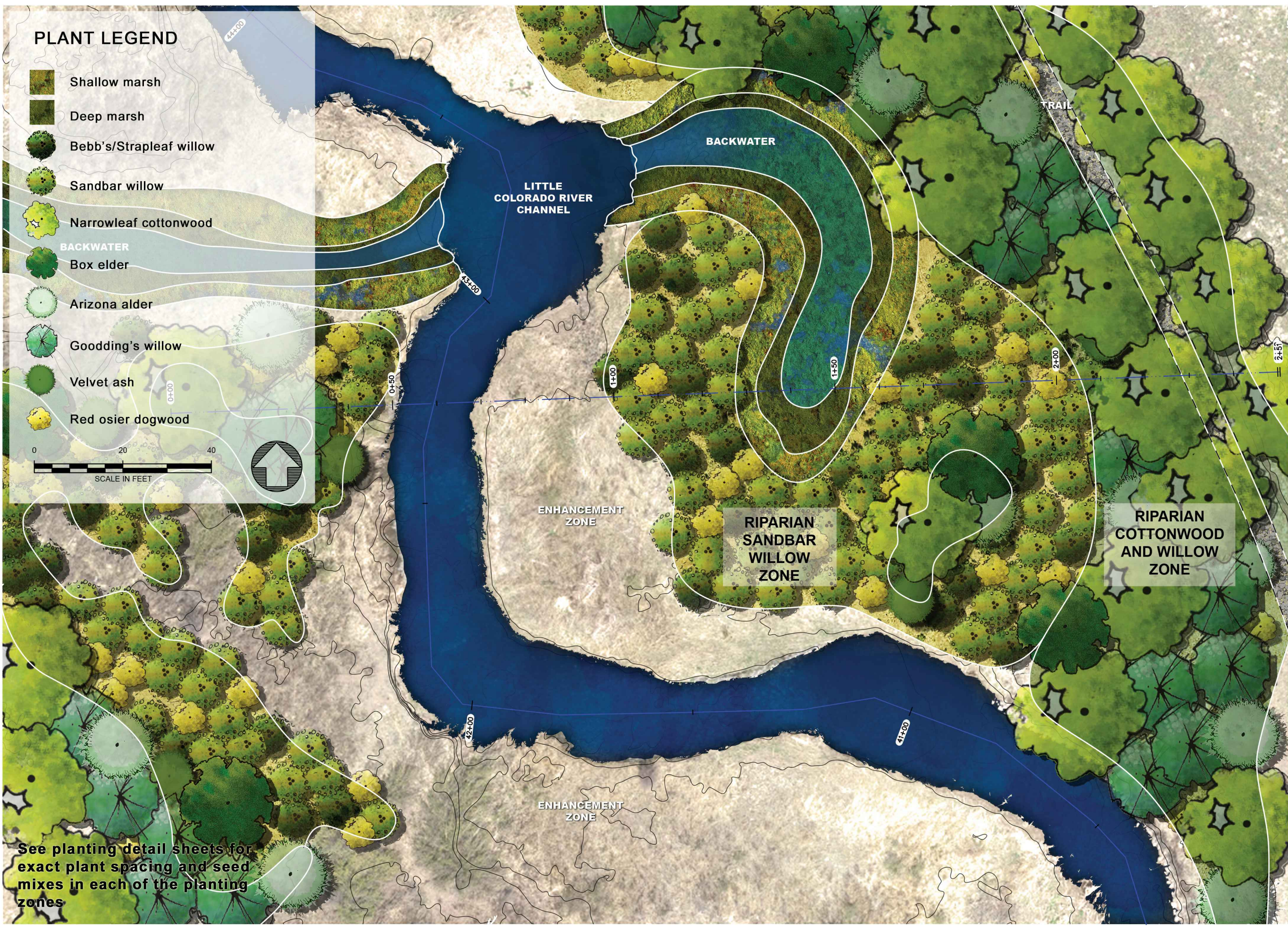
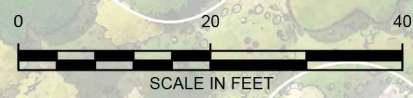
Phasing Notes:
All planting will occur in Phase 2 of the project

- Legend**
- Control Point
 - Fenceline (Approximate)
 - Existing Relic Floodplain Channel Network
 - Ordinary High Water Mark (from Approved PJD)
 - Wetlands (from Approved PJD)
 - Construction Item View, Section, or Detail Indicator: Letter Designation (Top) and Sheet Reference (Bottom)
 - Marsh Zone
 - Riparian Sandbar Willow Zone
 - Riparian Cottonwood and Willow Zone
 - Pollinator Habitat Seeding Zone



PLANT LEGEND

-  Shallow marsh
-  Deep marsh
-  Bebb's/Strapleaf willow
-  Sandbar willow
-  Narrowleaf cottonwood
-  BACKWATER
-  Box elder
-  Arizona alder
-  Goodding's willow
-  Velvet ash
-  Red osier dogwood



See planting detail sheets for exact plant spacing and seed mixes in each of the planting zones

PROJECT NAME:
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Apache County, AZ

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Order No. PO0000133003

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DRAWN BY: F. Dang, F. Phillips

DESIGNED BY: F. Phillips

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DATE: 12.22.20 **OEE PROJECT #:** AZ-009-03

DRAWING:
Planting Plan:
Typical Area

DRAWING #: VEG02 **SHEET #:** 9 OF 14 **REVISION #:**

PROJECT NAME:
Becker Lake Wildlife
Area: Little Colorado
River Habitat
Improvement Project

LOCATION:
Becker Lake
Wildlife Area
Apache County, AZ

PROJECT NUMBER:
AGFD17-182274-OXBOW
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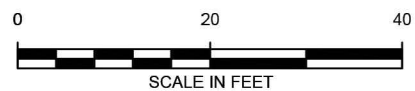
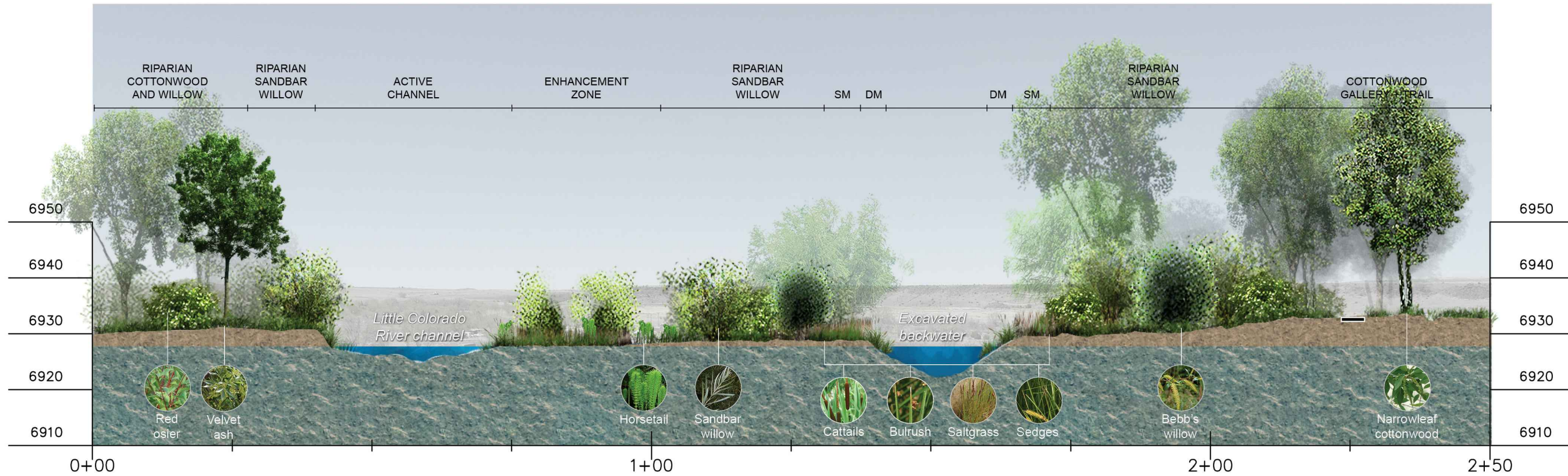
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DATE: 12.22.20 **OEE PROJECT #:** AZ-009-03

DRAWING:
Planting Plan:
Typical Section

DRAWING #: VEG03 **SHEET #:** 10 OF 14 **REVISION #:**



SM - Shallow Marsh
DM - Deep Marsh

- * Estimated 5-year plant growth shown
- ** Enhancement Zone will involve treatment of invasive plant species

PROJECT NAME:
Becker Lake Wildlife
Area: Little Colorado
River Habitat
Improvement Project

LOCATION:
Becker Lake
Wildlife Area
Apache County, AZ

PROJECT NUMBER:
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Order No. PO0000133003

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DRAWN BY: F. Dang

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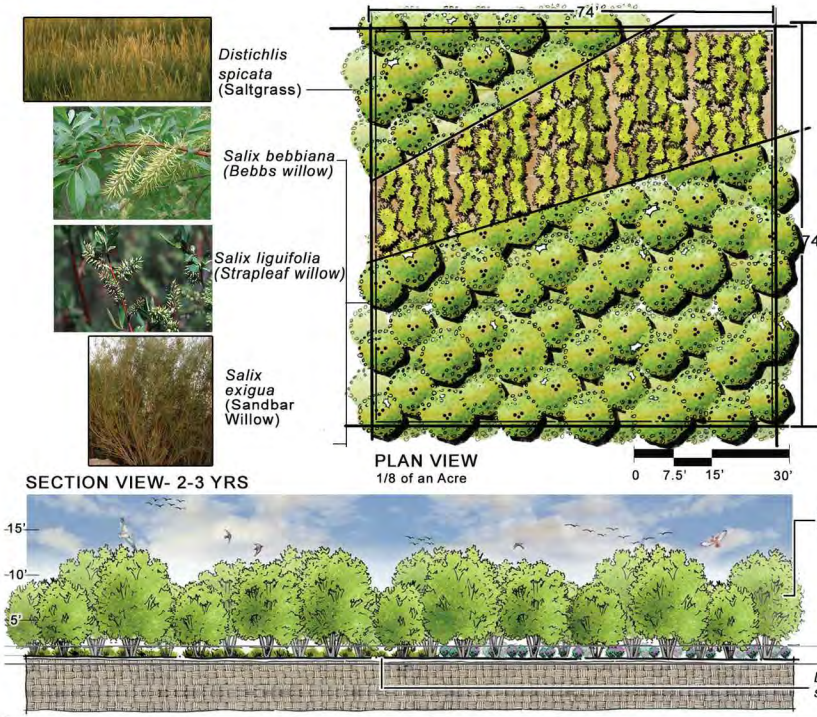


DATE: 12.22.20 **OEE PROJECT #:** AZ-009-03

DRAWING:
Planting Details:
Riparian Zone

DRAWING #: VEG04 **SHEET #:** 11 OF 14 **REVISION #:**

RIPARIAN SANDBAR WILLOW



VIEW OF PLANTING ZONES:
COTTONWOOD, GOODDING WILLOW,
AND SANDBAR WILLOW



PLANTING ZONE PROPERTIES:
Plant Specs:

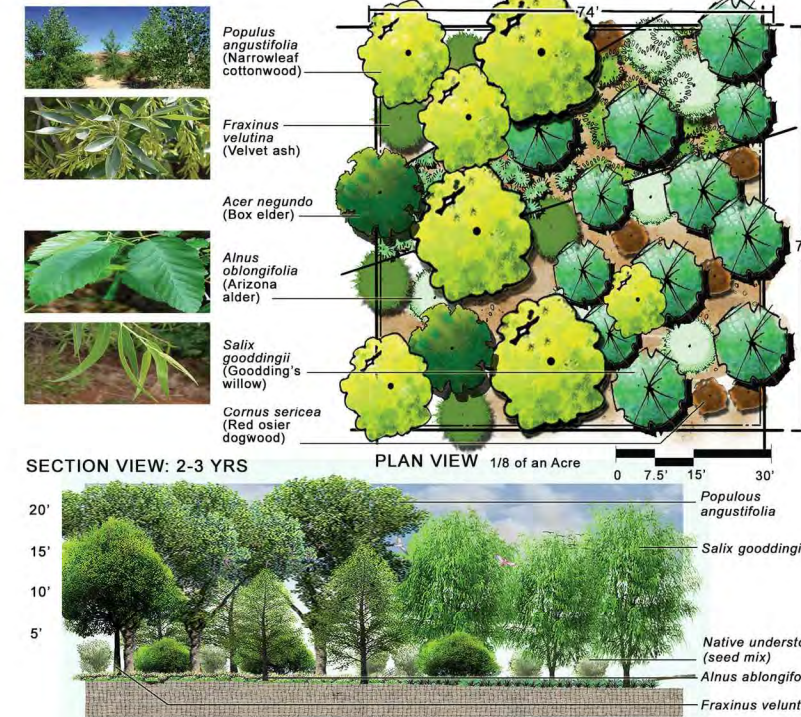
**Salix exigua*, *Salix bebbiana* and *Salix liguifolia* will be planted in flat areas within this planting zone as pole clusters 7' O.C. Where shrubby willows are planted on 3/1 slopes or greater they will be planted as vertical bundles 7' O.C. Each willow species will be planted in groups of at least 10 clusters or verticle bundles.

Willows will be planted into saturated soils with rootballs in the mean water table. Final willow planting boundaries shall be determined in the field by site characteristics.

**Distichlis spicata* 3" plugs, planted in rows 40" apart with 6" spacing between plants. Planted in between shrubby willow plantings.

Seed mix: The seed mix will be sown at a rate of 4lbs/acre throughout this plating zone

RIPARIAN COTTONWOOD AND WILLOW



VIEW OF PLANTING ZONES:
Riparian Cottonwood and Goodding Willow



PLANTING ZONE PROPERTIES:

Plant Specs:

**Populus Angustifolia* Pole and deep pot plantings 20-30' O.C in upper half of riparian CW/GW area.

**Fraxinus velutina* Deep pot plantings minimum 30' O.C in upper half of riparian CW/GW area.

**Acer negundo* Deep pot plantings minimum 30' O.C in upper half of riparian CW/GW area.

**Salix gooddingii* Pole and deep pot plantings 15-20' O.C in lower half of riparian CW/GW area

**Alnus ablongifolia* Deep pot plantings 30' O.C in lower half of riparian CW/GW area.

* Seed areas with seed mix listed below at a rate of 4lbs/acre

RIPARIAN SANDBAR WILLOW(4lbs/Acre)

| Species | Common Name | Type | % of Seed Mix/Lb |
|------------------------------|--------------------|------------|------------------|
| <i>Erigeron divergens</i> | spreading fleabane | Herbaceous | 50 |
| <i>Heliomeris multiflora</i> | showy goldeneye | Herbaceous | 50 |

RIPARIAN COTTONWOOD AND WILLOW(4lbs/Acre)

| Species | Common Name | Type | % of Seed Mix/Lb |
|-------------------------------|-------------------------|------------|------------------|
| <i>Erigeron divergens</i> | spreading fleabane | Herbaceous | 2% |
| <i>Oenothera flava</i> | yellow Evening Primrose | Herbaceous | 2% |
| <i>Phacelia crenulata</i> | desert Bluebell | Herbaceous | 2% |
| <i>Achnatherum hymenoides</i> | indian Ricegrass | Graminoid | 5% |
| <i>Bouteloua curtipendula</i> | side oats gramma | Graminoid | 5% |
| <i>Bouteloua gracilis</i> | blue grama | Graminoid | 5% |
| <i>Bromus ciliatus</i> | fringed brome | Graminoid | 30% |
| <i>Sporobolus airoides</i> | alkali Sacaton | Graminoid | 30% |
| <i>Sporobolus contractus</i> | spike dropseed | Graminoid | 10% |
| <i>Sporobolus cryptandrus</i> | sand dropseed | Graminoid | 9% |

PROJECT NAME:
Becker Lake Wildlife
Area: Little Colorado
River Habitat
Improvement Project

LOCATION:
Becker Lake
Wildlife Area
Apache County, AZ

PROJECT NUMBER:
AGFD17-182274-OXBOW
Order No. PO0000133003

PROJECT PHASE:
EAC Phasing Exhibit

CLIENT/PROJECT MANAGER:
Arizona Game & Fish Department
5000 West Carefree Highway
Phoenix, AZ 85086
(602) 942-3000

NATIVE VEGETATION DESIGN:
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401 South Leroux Street
Flagstaff, AZ 86001
(928) 773-1530

RESTORATION TECHNICAL ADVISOR:
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(505) 577-9625

DRAWN BY: F. Dang

DESIGNED BY: F. Phillips

ENGINEER OF RECORD:

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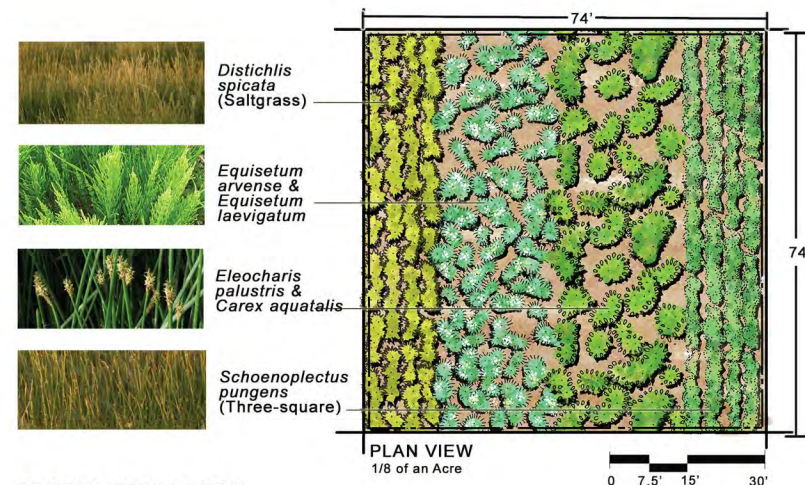


DATE: 12.22.20 **OEE PROJECT #:** AZ-009-03

DRAWING:
Planting Details:
Marsh Zone

DRAWING #: VEG05 **SHEET #:** 12 OF 14 **REVISION #:**

SHALLOW MARSH



VIEW OF PLANTING ZONES:
SHALLOW MARSH AND DEEP MARSH



PLANTING ZONE PROPERTIES:

Plant Specs: Patches will alternate between species. Seeds will be applied at 4 pounds per acre.

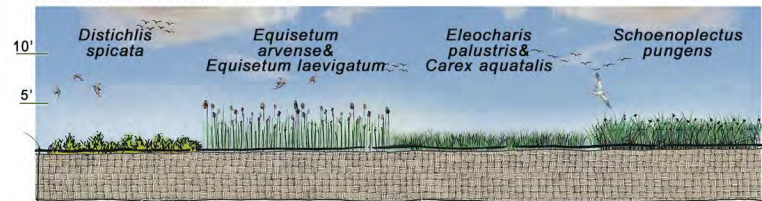
**Distichlis spicata* 3" plugs, planted in 14' wide bands with 3' spacing between plants

**Eleocharis palustris* and *Carex aquatalis* 3" plugs, planted in alternating 14' wide bands with 3' spacing between plants in bands

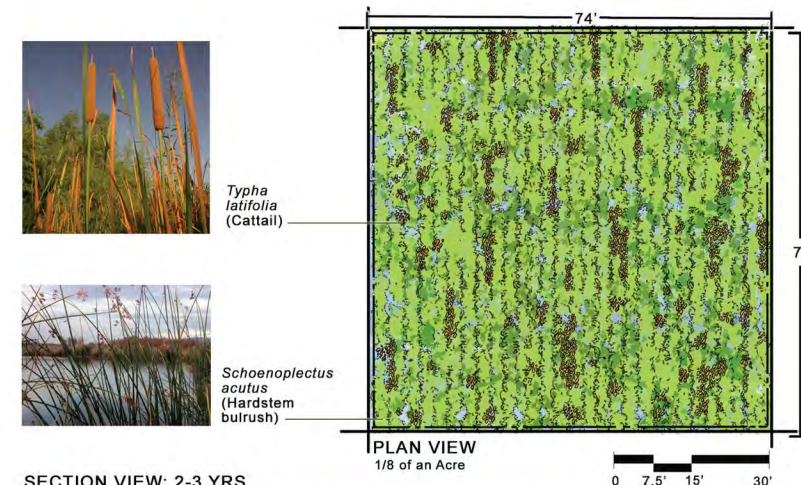
**Equisetum arvense* and *Equisetum laevigatum* 3" plugs, planted in alternating 14' wide bands with 3' spacing between plants in bands

**Schoenoplectus pungens* 3" plugs, planted in 14' wide bands with 3' spacing between plants

SECTION VIEW: 2-3 YRS



DEEP MARSH



VIEW OF PLANTING ZONES:
SHALLOW AND DEEP MARSH



PLANTING ZONE PROPERTIES:

Plant Specs: It is critical to ensure the site is clear of all non-native vegetation (i.e. canary reed grass) and all plugs are free of non-native wetland species. Store plugs in a cool, moist place until ready to plant. After planting, trim all vegetative growth to no less than 18" above the maximum water level. Bulrush plugs shall have at least some vegetative growth above the highest water level when planted. Leave all resprouting cattails (*Typha*), do not weed native wetland species.

**Schoenoplectus californicus* 3" plugs, planted 5' O.C.

**Typha latifolia* 3" plugs, planted 5' O.C.

SECTION VIEW: 2-3 YRS



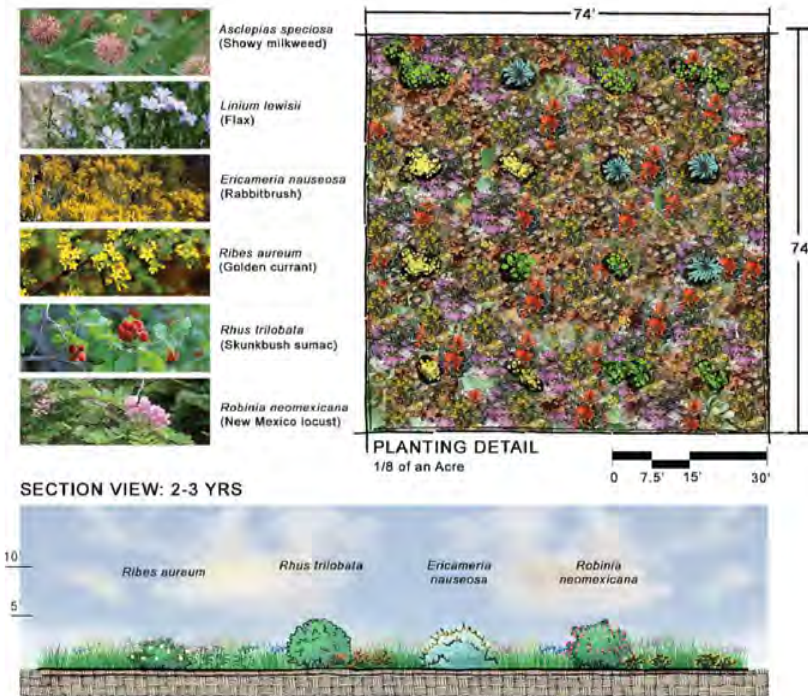
SHALLOW MARSH (4lbs/Acre)

| Species | Common Name | Type | % of Seed Mix/Lb |
|-------------------------------|--------------------|------------|------------------|
| <i>erigeron divergens</i> | spreading fleabane | Herbaceous | 10% |
| <i>mimulus guttatus</i> | seep monkey flower | Herbaceous | 10% |
| <i>Achnatherum hymenoides</i> | indian Ricegrass | Graminoid | 10% |
| <i>Sporobolus airoides</i> | Alkali Sacaton | Graminoid | 30% |
| <i>Sporobolus contractus</i> | spike dropseed | Graminoid | 30% |
| <i>Sporobolus cryptandrus</i> | sand dropseed | Graminoid | 30% |

DEEP MARSH

| Species | Common Name | Type | % of Seed Mix/Lb |
|---------|-------------|------|------------------|
| None | | | |

POLLINATOR HABITAT



VIEW OF PLANTING ZONES: POLLINATOR HABITAT



PLANTING ZONE PROPERTIES:

Plant Specs: All herbaceous plants will be seeded at 4 pounds per acre

The following shrubs, in D40 pots, will be planted 10' apart o.c., with 3 specimens of each species per acre:

- * Utah serviceberry (*Amelanchier utahensis*)
- * Apache plume (*Fallugia paradoxa*)
- * Cliffrose (*Cowania Mexicana*)
- * Rabbitbrush (*Ericameria nauseosa*)
- * Snakeweed (*Gutierrezia sarothrae*)
- * Wolfberry (*Lycium barbarum*)
- * Pale wolfberry (*Lycium pallidum*)
- * Western chokecherry (*Prunus virginiana*)
- * Golden current (*Ribes aureum*)
- * New Mexico Locust (*Robinia neomexicana*)
- * Woods rose (*Rosa woodsii*)
- * Skunkbush sumac (*Rhus trilobata*)

Note that the plan detail shows a sampling of 4 species in 1/8 acre

| POLLINATOR HABITAT(4lbs/Acre) | | | |
|-----------------------------------|---------------------------|------------|------------------|
| Species | Common Name | Type | % of Seed Mix/Lb |
| Achilla millefolium | Common yarrow | Herbaceous | 5% |
| Asclepias asperula | Spider Milkweed | Herbaceous | 3% |
| Asclepias latifolia | broadleaf milkweed | Herbaceous | 3% |
| Asclepias subverticillata | horsetail milkweed | Herbaceous | 3% |
| Asclepias eriocarpa | Woollypod Milkweed | Herbaceous | 3% |
| Asclepias engelmanniana | Englemans milkweed | Herbaceous | 3% |
| Asclepias speciosa | showy milkweed | Herbaceous | 3% |
| Asclepias tuberosa spp. interior) | Butterflyweed | Herbaceous | 3% |
| Castilleja minata | scarlet indian paintbrush | Herbaceous | 3% |
| Cirsium neomexicana | New Mexico Thistle | Herbaceous | 3% |
| Cleome serrulata | Rocky Mountain beeplant | Herbaceous | 3% |
| Dalea candida | white prairie clover | Herbaceous | 3% |
| Erigeron divergens | spreading fleabane | Herbaceous | 3% |
| Eriogonum wrightii | Wrights buckwheat | Herbaceous | 3% |
| Helianthus annuus | Common sunflower | Herbaceous | 3% |
| Iris missouriensis | Rocky Mountain iris | Herbaceous | 3% |
| Linium lewisii | wildblue flax | Herbaceous | 3% |
| Lupinus brevicaulis | shortstem lupine | Herbaceous | 3% |
| Lupinus argenteus | silvery lupine | Herbaceous | 3% |
| Lupinus arizonicus | Arizona lupine | Herbaceous | 3% |
| Lupinus palmeri | bluebonnet Lupine | Herbaceous | 5% |
| Monordara fistulosa | wild bergamont | Herbaceous | 3% |
| Oenothera caespitosa | tufted evening primrose | Herbaceous | 3% |
| Oenothera flava | yellow Evening Primrose | Herbaceous | 3% |
| Penstemon eatonii | firecracker penstemon | Herbaceous | 3% |
| penstemon palmeri | Palmer's penstemon | Herbaceous | 3% |
| Penstemon strictus | Rocky Mountain Penstemon | Herbaceous | 3% |
| Ratibida columnifera | Prairie coneflower | Herbaceous | 3% |
| Solidago wrightii | wrights goldenrod | Herbaceous | 3% |
| Sphaeralcea spp | globe mallow | Herbaceous | 3% |
| Symphotrichum ascendens | Western aster | Herbaceous | 3% |
| Symphotrichum foliacium | leafy aster | Herbaceous | 3% |

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Becker Lake Wildlife Area: Little Colorado River Habitat Improvement Project

LOCATION:
Becker Lake Wildlife Area
Apache County, AZ

PROJECT NUMBER:
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Order No. PO0000133003

PROJECT PHASE:
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CLIENT/PROJECT MANAGER:
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DATE: 12.22.20 **OEE PROJECT #:** AZ-009-03

DRAWING:
Planting Details:
Pollinator Habitat Zone

DRAWING #: VEG06 **SHEET #:** 13 OF 14 **REVISION #:**

PROJECT NAME:
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Apache County, AZ

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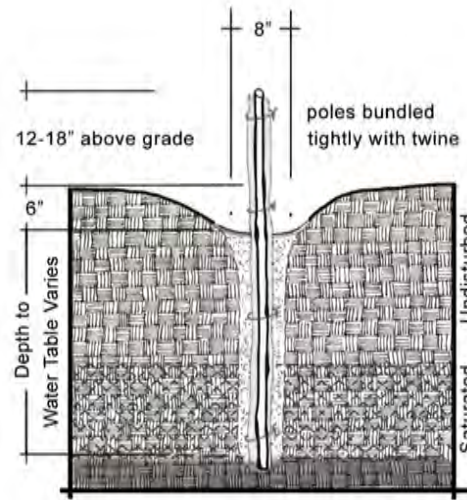
DRAWING:
Planting Details:
Deep Pot, Pole Planting,
Microberm, & Schedule

DRAWING #: VEG07 **SHEET #:** 14 OF 14 **REVISION #:**

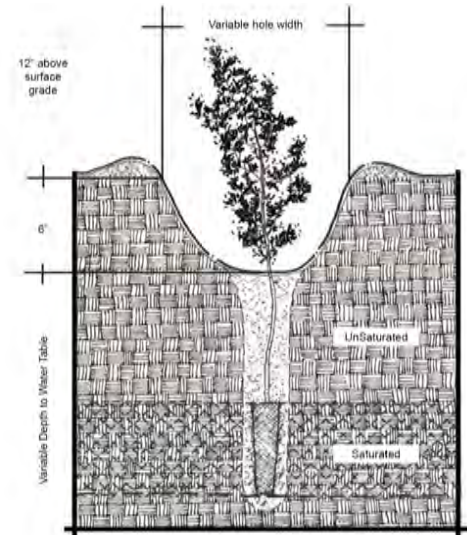
PLANTING SCHEDULE FOR BECKER LAKE WILDLIFE AREA

| DESCRIPTION | PLAN HATCH | PLANTING ELEVATION RELATED TO WATER SURFACE(INCHES) | DIMENSION (AREA OR LENGTH) | SPECIES COMPOSITION | TOTAL QUANTITY | PLANTING NOTES |
|--------------------------------|------------|---|----------------------------|---|--|--|
| DEEP MARSH | | (6) - (24) | 0.5 acres | CATTAIL 50% (<i>Typha latifolia</i>) HARDSTEM BULRUSH 50% (<i>Schoenoplectus acutus</i>) | 436 436 | 3" plugs, planted 5' O.C. |
| SHALLOW MARSH | | (2) - (6) | 0.5 acres | SALTGRASS 16% (<i>Distichlis spicata</i>) WATER SEDGE 16% (<i>Carex aquatilis</i>) SPIKERUSH 16% (<i>Eleocharis palustris</i>) HORSETAIL 16% (<i>Equisetum arvense</i>) SMOOTH HORSETAIL 16% (<i>Equisetum laevigatum</i>) COMMON THREESQUARE 16% (<i>Schoenoplectus pungens</i>) Seed Mix | 86 86 86 86 86 86 4 pounds | 3" plugs, planted in 14' wide bands with 3' spacing between plants, patches will alternate between species 3" plugs, planted in 14' wide bands with 3' spacing between plants, patches will alternate between species 3" plugs, planted in 14' wide bands with 3' spacing between plants, patches will alternate between species 3" plugs, planted in 14' wide bands with 3' spacing between plants, patches will alternate between species 3" plugs, planted in 14' wide bands with 3' spacing between plants, patches will alternate between species See seed specifications and zone planting detail sheet for more details |
| RIPARIAN SANDBAR WILLOW | | 2 - 0 | 3.0 acres | SANDBAR WILLOW 50% (<i>Salix exigua</i>) BEBB'S WILLOW 25% (<i>Salix bebbiana</i>) STRAPLEAF WILLOW 25% (<i>Salix ligulifolia</i>) SALTGRASS (<i>Distichlis spicata</i>) Seed Mix | 8890 4445 4445 6534 12 pounds | Pole and deep pot plantings in flat areas within this planting zone as pole clusters 7' O.C. Where shrubby willows are planted on 3/1 slopes or greater, they will be planted as vertical bundles 7' O.C. Each willow species will be planted in groups of at least 10 clusters or vertical bundles. Willows will be planted into saturated soils with rootballs in the mean water table. Final willow planting boundaries shall be determined in the field by site characteristics. 3" plugs, planted in rows 40" apart with 6' spacing between plants. Plant in between shrubby willow plantings. See seed specifications and zone planting detail sheet for more details |
| RIPARIAN COTTONWOOD AND WILLOW | | 12 - 2 | 5.0 acres | BOX ELDER 20% (<i>Acer negundo</i>) ARIZONA ALDER 20% (<i>Alnus oblongifolia</i>) VELVET ASH 20% (<i>Fraxinus velutina</i>) NARROWLEAF COTTONWOOD 20% (<i>Populus angustifolia</i>) GOODDING'S WILLOW 20% (<i>Salix gooddingii</i>) Seed Mix | 48 48 48 70 142 20 pounds | Deep pot plantings minimum 30' O.C in upper half of riparian CW/GW area. Deep pot plantings 30' O.C in lower half of riparian CW/GW area. Deep pot plantings minimum 30' O.C in upper half of riparian CW/GW area. Pole and deep pot plantings 20-30' O.C in upper half of riparian CW/GW area. Pole and deep pot plantings 15-20' O.C in lower half of riparian CW/GW area. See seed specifications and zone planting detail sheet for more details |
| POLLINATOR HABITAT | | - | 0.5 acres | UTAH SERVICEBERRY 8.3% (<i>Amelanchier utahensis</i>) APACHE PLUME 8.3% (<i>Fallugia paradoxa</i>) CLIFFROSE 8.3% (<i>Cowania Mexicana</i>) RABBITBRUSH 8.3% (<i>Ericameria nauseosa</i>) SNAKEWEED 8.3% (<i>Gutierrezia sarothrae</i>) WOLFBERRY 8.3% (<i>Lycium barbarum</i>) PALE WOLFBERRY 8.3% (<i>Lycium pallidum</i>) WESTERN CHOKECHERRY 8.3% (<i>Prunus virginiana l. var.</i>) GOLDEN CURRANT 8.3% (<i>Ribes aureum</i>) NEW MEXICO LOCUST 8.3% (<i>Robinia neomexicana</i>) WOODS ROSE 8.3% (<i>Rosa woodsii</i>) FRAGRANT SUMAC 8.3% (<i>Rhus trilobata</i>) Seed Mix | 18 18 18 18 18 18 18 18 18 18 2 pounds | See seed specifications and zone planting detail sheet for more details |

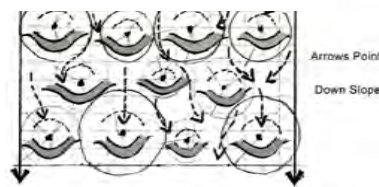
NOTE: WETLAND PLUGS SHALL BE FROM NATIVE SPECIES ADAPTED TO THE REGION. ANY NATIVE WETLAND SOD PRESENT IN HARVESTING LOCATIONS DESIGNATED BY THE AML PROGRAM OR ITS AGENT(S) SHALL BE ACCEPTABLE MATERIAL FOR TRANSPLANT, UNLESS NOXIOUS WEEDS ARE PRESENT. IF HARVEST LOCATIONS CANNOT SUPPLY SUFFICIENT PLUGS TO PLANT DESIGNATED AREAS AS SHOWN ON PLANS, WETLAND PLUGS MAY BE PURCHASED AND DELIVERED TO THE SITE. PURCHASED WETLAND PLUGS MUST BE SPECIES LISTED IN THE TABLE ABOVE OR IN THE PLANTING SPECIFICATIONS.



POLE/CLUSTER PLANTING DETAIL

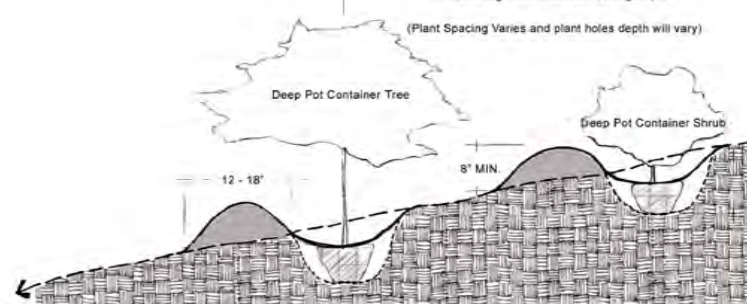


DEEP POT PLANTING DETAIL



Alternating Plant and Berm Arrangement

(Plant Spacing Varies and plant holes depth will vary)



MICROBERM PLANTING DETAIL



DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, LOS ANGELES DISTRICT
3636 N CENTRAL AVENUE, SUITE 900
PHOENIX, AZ 85012-1939

May 27, 2020

SUBJECT: Preliminary Jurisdictional Determination

David Dorum
Arizona Game & Fish Department
2787 E. White Mountain Blvd.
Pinetop, AZ 85935

Dear Mr. Dorum:

I am responding to your request (File No. SPL-2020-00300) dated May 5, 2020 for a preliminary Department of the Army jurisdictional determination (JD) for the Becker Wildlife Area. This site is within approximately 47.52 acres of land, located in portions of Section 29 and 32, Township 9N, Range 29E (34.132662°N, -109.296755°W), Town of Springerville, Apache County, Arizona.

The Corps' evaluation process for determining whether a Department of the Army permit is needed involves two tests. If both tests are met, a permit would likely be required. The first test determines whether the proposed project is located within the Corps' geographic jurisdiction (i.e., it is within a water of the United States). The second test determines whether as proposed, the project involves a regulated activity under Corps' authority, i.e., Section 10 of the Rivers and Harbors Act of 1899, Section 404 of the Clean Water Act, or Section 103 of the Marine Protection Research and Sanctuaries Act. The determination in this letter pertains only to the question of geographic jurisdiction.

Based on available information, I have preliminarily determined waters of the U.S. may be present on your proposed project site in the approximate locations noted on the enclosed map. The basis for this finding may be found on the enclosed Preliminary Jurisdictional Determination (JD) form. Preliminary JDs are non-binding indications of the presence of waters of the U.S., including wetlands, on a parcel. Preliminary JDs are advisory in nature and may not be appealed. If you accept this determination, please sign and date this form and return to the issuing office within two weeks of receipt.

This determination was conducted to identify the extent of the Corps' Clean Water Act jurisdiction on your proposed project site, as identified in your request. This determination may not be valid for the wetland conservation provisions of the Food Security Act of 1985. If you or your tenant are USDA program participants, or anticipate participation in USDA programs, you should request a certified wetland determination from the local office of the Natural Resources Conservation Service, prior to starting work.

Thank you for participating in the regulatory program. If you have any questions, please contact Ann Palaruan at (602) 230-6955 or via e-mail at Cynthia.A.Palaruan@usace.army.mil. Please help me to evaluate and improve the regulatory experience for others by completing the [customer survey](http://corpsmapu.usace.army.mil/cm_apex/f?p=regulatory_survey) form at http://corpsmapu.usace.army.mil/cm_apex/f?p=regulatory_survey.

Sincerely,

Sallie Diebolt
Chief, Arizona Branch
Regulatory Division

Enclosures

Notice of Administrative Appeal Options and Process
PJD Form
PJD Aerial

**NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND
REQUEST FOR APPEAL**

| | | |
|--|-----------------------------|--------------------|
| Applicant: Arizona Game & Fish Department | File Number: SPL-2020-00300 | Date: May 27, 2020 |
|--|-----------------------------|--------------------|

| | | |
|--------------|--|---|
| Attached is: | See Section below | |
| | INITIAL PROFFERED PERMIT (Standard Permit or Letter of permission) | A |
| | PROFFERED PERMIT (Standard Permit or Letter of permission) | B |
| | PERMIT DENIAL | C |
| | APPROVED JURISDICTIONAL DETERMINATION | D |
| X | PRELIMINARY JURISDICTIONAL DETERMINATION | E |

SECTION I - The following identifies your rights and options regarding an administrative appeal of the above decision. Additional information may be found at http://www.usace.army.mil/cecw/pages/reg_materials.aspx or Corps regulations at 33 CFR Part 331.

A: INITIAL PROFFERED PERMIT: You may accept or object to the permit.

- **ACCEPT:** If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- **OBJECT:** If you object to the permit (Standard or LOP) because of certain terms and conditions therein, you may request that the permit be modified accordingly. You must complete Section II of this form and return the form to the district engineer. Your objections must be received by the district engineer within 60 days of the date of this notice, or you will forfeit your right to appeal the permit in the future. Upon receipt of your letter, the district engineer will evaluate your objections and may: (a) modify the permit to address all of your concerns, (b) modify the permit to address some of your objections, or (c) not modify the permit having determined that the permit should be issued as previously written. After evaluating your objections, the district engineer will send you a proffered permit for your reconsideration, as indicated in Section B below.

B: PROFFERED PERMIT: You may accept or appeal the permit

- **ACCEPT:** If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- **APPEAL:** If you choose to decline the proffered permit (Standard or LOP) because of certain terms and conditions therein, you may appeal the declined permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

C: PERMIT DENIAL: You may appeal the denial of a permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

D: APPROVED JURISDICTIONAL DETERMINATION: You may accept or appeal the approved JD or provide new information.

- ACCEPT: You do not need to notify the Corps to accept an approved JD. Failure to notify the Corps within 60 days of the date of this notice means that you accept the approved JD in its entirety, and waive all rights to appeal the approved JD.
- APPEAL: If you disagree with the approved JD, you may appeal the approved JD under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The Preliminary JD is not appealable. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also you may provide new information for further consideration by the Corps to reevaluate the JD.

SECTION II - REQUEST FOR APPEAL or OBJECTIONS TO AN INITIAL PROFFERED PERMIT

REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record.)

ADDITIONAL INFORMATION: The appeal is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the record. However, you may provide additional information to clarify the location of information that is already in the administrative record.

POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

If you have questions regarding this decision and/or the appeal process you may contact:

Ann Palaruan
Project Manager
U.S. Army Corps of Engineers
Los Angeles District
3636 N Central Avenue, Suite 900
Phoenix, AZ 85012-1939
Phone: (602) 230-6955
Email: Cynthia.A.Palaruan@usace.army.mil

If you only have questions regarding the appeal process you may also contact:

Thomas J. Cavanaugh
Administrative Appeal Review Officer
U.S. Army Corps of Engineers
South Pacific Division
450 Golden Gate Ave.
San Francisco, California 94102
Phone: (415) 503-6574
Email: thomas.j.cavanaugh@usace.army.mil

RIGHT OF ENTRY: Your signature below grants the right of entry to Corps of Engineers personnel, and any government consultants, to conduct investigations of the project site during the course of the appeal process. You will be provided a 15 day notice of any site investigation, and will have the opportunity to participate in all site investigations.

Signature of appellant or agent.

Date:

Telephone number:

- 1) The Corps of Engineers believes that there may be jurisdictional aquatic resources in the review area, and the requestor of this PJD is hereby advised of his or her option to request and obtain an approved JD (AJD) for that review area based on an informed decision after having discussed the various types of JDs and their characteristics and circumstances when they may be appropriate.
- 2) In any circumstance where a permit applicant obtains an individual permit, or a Nationwide General Permit (NWP) or other general permit verification requiring "pre-construction notification" (PCN), or requests verification for a non-reporting NWP or other general permit, and the permit applicant has not requested an AJD for the activity, the permit applicant is hereby made aware that: (1) the permit applicant has elected to seek a permit authorization based on a PJD, which does not make an official determination of jurisdictional aquatic resources; (2) the applicant has the option to request an AJD before accepting the terms and conditions of the permit authorization, and that basing a permit authorization on an AJD could possibly result in less compensatory mitigation being required or different special conditions; (3) the applicant has the right to request an individual permit rather than accepting the terms and conditions of the NWP or other general permit authorization; (4) the applicant can accept a permit authorization and thereby agree to comply with all the terms and conditions of that permit, including whatever mitigation requirements the Corps has determined to be necessary; (5) undertaking any activity in reliance upon the subject permit authorization without requesting an AJD constitutes the applicant's acceptance of the use of the PJD; (6) accepting a permit authorization (e.g., signing a proffered individual permit) or undertaking any activity in reliance on any form of Corps permit authorization based on a PJD constitutes agreement that all aquatic resources in the review area affected in any way by that activity will be treated as jurisdictional, and waives any challenge to such jurisdiction in any administrative or judicial compliance or enforcement action, or in any administrative appeal or in any Federal court; and (7) whether the applicant elects to use either an AJD or a PJD, the JD will be processed as soon as practicable. Further, an AJD, a proffered individual permit (and all terms and conditions contained therein), or individual permit denial can be administratively appealed pursuant to 33 C.F.R. Part 331. If, during an administrative appeal, it becomes appropriate to make an official determination whether geographic jurisdiction exists over aquatic resources in the review area, or to provide an official delineation of jurisdictional aquatic resources in the review area, the Corps will provide an AJD to accomplish that result, as soon as is practicable. This PJD finds that there "*may be*" waters of the U.S. and/or that there "*may be*" navigable waters of the U.S. on the subject review area, and identifies all aquatic features in the review area that could be affected by the proposed activity, based on the following information:

SUPPORTING DATA. Data reviewed for PJD (check all that apply)

Checked items should be included in subject file. Appropriately reference sources below where indicated for all checked items:

- Maps, plans, plots or plat submitted by or on behalf of the PJD requestor:
 - Data sheets prepared/submitted by or on behalf of the PJDrequestor. _____
 - Data sheets prepared by the Corps: _____
 - Corps navigable waters' study: _____
 - U.S. Geological Survey Hydrologic Atlas: _____
 - USGS NHD data.
 - USGS 8 and 12 digit HUC maps.
 - U.S. Geological Survey map(s). Cite scale & quad name: Springerville Quadrangle
 - Natural Resources Conservation Service Soil Survey. Citation: NRCS
National wetlands inventory map(s). Cite name: USFWS
 - State/local wetland inventory map(s): General State Map
 - FEMA/FIRM maps: Apache County
- Photographs: Aerial (Name & Date): ESRI 4/2020
 Field photographs 4/2020

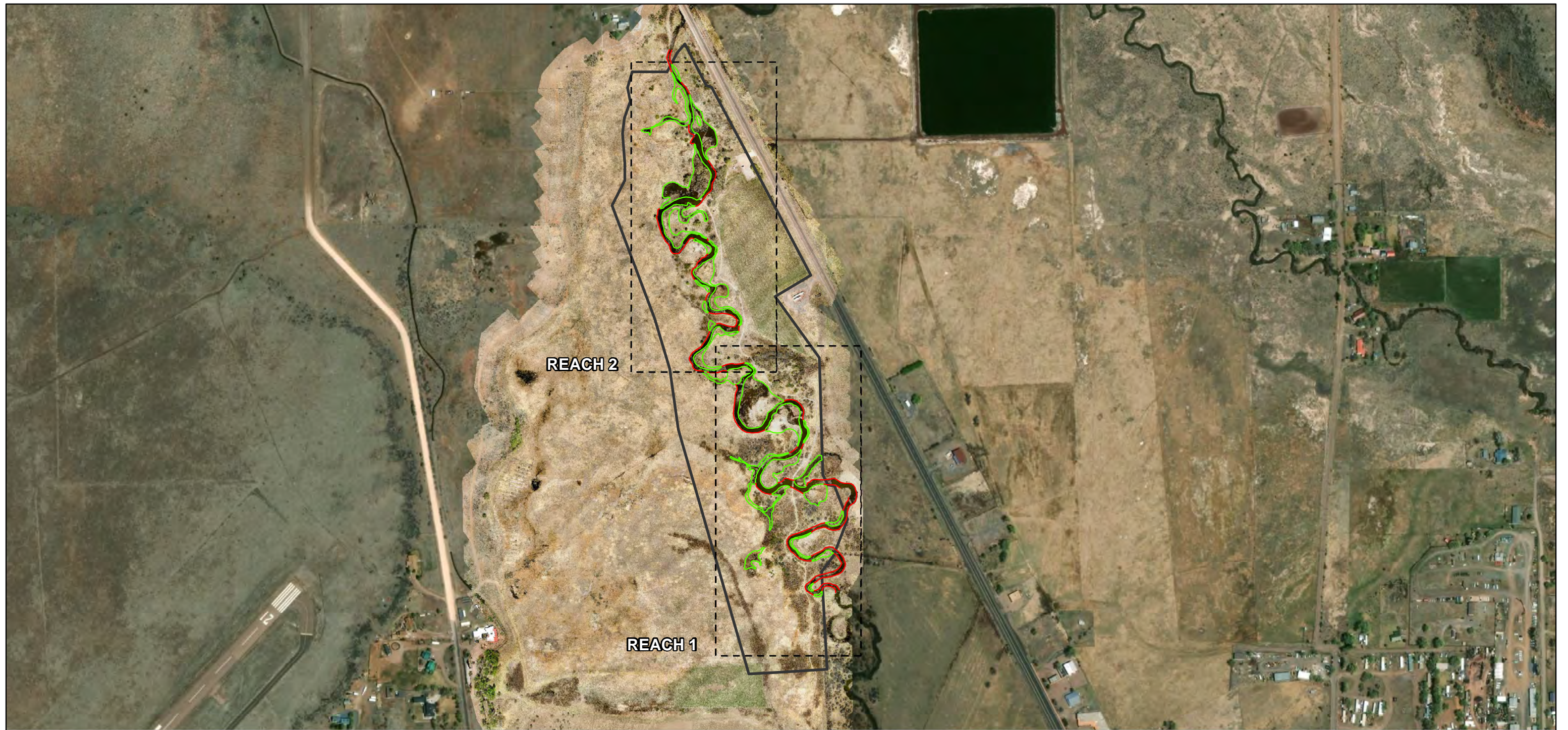
IMPORTANT NOTE: The information recorded on this form has not necessarily been verified by the Corps and should not be relied upon for later jurisdictional determinations.



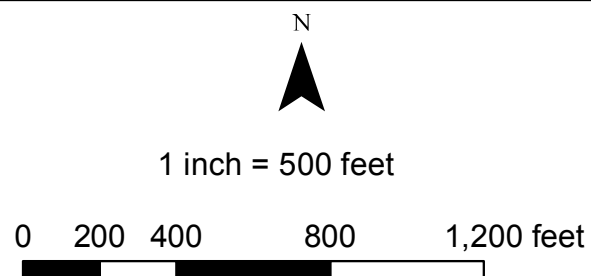
Signature and date of
Regulatory staff member
completing PJD

Signature and date of
person requesting PJD
(REQUIRED, unless obtaining
the signature is impracticable)¹

¹ Districts may establish timeframes for requestor to return signed PJD forms. If the requestor does not respond within the established time frame, the district may presume concurrence and no additional follow up is necessary prior to finalizing an action.



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*****PRELIMINARY (RGL 08-02)*****

SECTION 404 JURISDICTIONAL DELINEATION
 U.S. Army Corps of Engineers, Los Angeles District
 Application No. SPL - 2020 - 00300

| | | | |
|--|--|--|---------------|
| | Boundary of area surveyed for jurisdictional waters of the United States | | Wetlands |
| | Ordinary High Water Mark | | Sample Points |
| | Potential Waters of the United States | | OHWM Points |
| | | | Cutsheet Line |

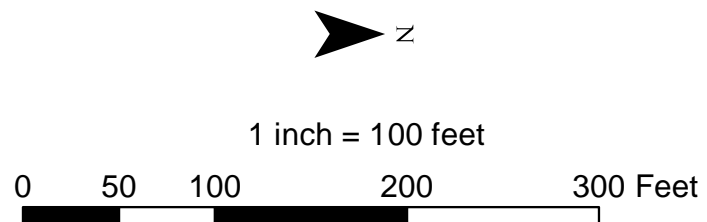
Site Visit(Y/N) 5/27/2020 JD Date
 see scale bar Scale 4/2020 Date of Photograph
 Ann Palaruan Corps Project Manager
 Sheet 1 of 3

*****PRELIMINARY (RGL 08-02)*****

BECKER WILDLIFE AREA



Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



*****PRELIMINARY (RGL 08-02)*****

SECTION 404 JURISDICTIONAL DELINEATION
 U.S. Army Corps of Engineers, Los Angeles District
 Application No. SPL - 2020-00300

| | | | |
|--|--|--|---------------|
| | Boundary of area surveyed for jurisdictional waters of the United States | | Wetlands |
| | Ordinary High Water Mark | | Sample Points |
| | Potential Waters of the United States | | OHWM Points |
| | | | Cutsheet Line |

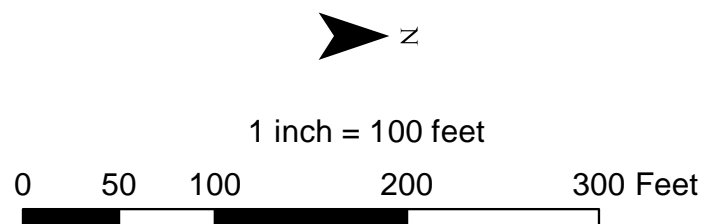
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 see scale bar Scale 4/2020 Date of Photograph
 Ann Palaruan Corps Project Manager
 Sheet 2 of 3

*****PRELIMINARY (RGL 08-02)*****

BECKER WILDLIFE AREA: REACH 1



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*****PRELIMINARY (RGL 08-02)*****

SECTION 404 JURISDICTIONAL DELINEATION
 U.S. Army Corps of Engineers, Los Angeles District
 Application No. SPL - 2020 - 00300

| | | | |
|--|--|--|---------------|
| | Boundary of area surveyed for jurisdictional waters of the United States | | Wetlands |
| | Ordinary High Water Mark | | Sample Points |
| | Potential Waters of the United States | | OHWM Points |
| | | | Cutsheet Line |

Site Visit(Y/N) 5/27/2020 JD Date
 see scale bar Scale 4/2020 Date of Photograph
 Ann Palaruan Corps Project Manager
 Sheet 3 of 3

*****PRELIMINARY (RGL 08-02)*****

BECKER WILDLIFE AREA: REACH 2