Arizona Water Protection Fund
FY 2009 Grant Application Review

Application # WPF0384 **Applicant:** NORTHERN ARIZONA UNIVERSITY, COLLEGE OF ENGINEERING

Title of Project: SINCLAIR WASH RIPARIAN ENHANCEMENT PROJECT

Additional materials were submitted with this application that could not be reproduced and distributed for review. These materials may be reviewed in person at the Arizona Water Protection Fund offices at (3550 N. Central Avenue, 4th Floor, Phoenix). The additional materials available are the following:

_____ **Maps**
_____ **Photographs**
_✓_ **Disk** SCOPE OF WORK + BUDGET
_____ **Other**

Sinclair Wash Riparian Enhancement Project

AWPF Application Package

Submitted by:

NAU- Dept. of Biological Sciences
College of Engineering and Natural Sciences
Thomas Whitham, Regents Professor
PO Box 5460
Flagstaff, AZ 86011

6/10/08

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COPY

Arizona Water Protection Fund
Application Cover Page
FY 2009

WPF0384

Title of Project: Sinclair Wash Riparian Enhancement Project

Type of Project:
- ☒ Capital or Other
- ☐ Water Conservation
- ☐ Research

Stream Type:
- ☐ Perennial
- ☐ Intermittent
- ☒ Ephemeral

Your level of commitment to maintenance of project benefits and capital improvements:
☐ < 5 years ☐ 5-10 years ☐ 11-15 years ☒ 16-20 years

Applicant Information:
Name/Organization: Northern Arizona University, College of Engineering and Natural Sciences, Dept. of Biological Sciences
Address 1:
Address 2:
City:
State:
ZIP Code:
Phone:
Fax:
Tax ID No.:

Inside an AMA: Yes ☐ No ☒

If yes, which AMA:
- ☐ Phoenix
- ☐ Tucson
- ☐ Prescott
- ☐ Pinal
- ☐ Santa Cruz

Type of Application:
- ☒ New
- ☐ Continuation

Contact Person:
Name: Thomas Whitham
Title: Regents Professor
Phone:
Fax:
e-mail: Thomas.Whitham@nau.edu

Any Previous AWPF Grants:
☐Yes ☒No

If yes, please provide Grant #(s):

Arizona Water Protection Fund Grant Amount Requested:

$309,390.00

If the application is funded, will the Grantee intend to request an advance:
☒**Yes** ☐**No**

Matching Funds Obtained and Secured:

Applicant/Agency/Organization:	Amount ($):
1. Applicant	52,540.00
2. NAU-Facilities	12,800
3. Willow Bend Env. Ed Center	5,400.00
4. AZGF	1,020.00
5. NAU-CESE and Wildlife Society	2,100.00
Total:	$73,860.00

Has your legal counsel or contracting authority reviewed and accepted the Grant Award Contract General Provisions?
☒Yes ☐No ☐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.

Typed Name of Applicant or Applicant's Authorized Representative Wilma G. Ennenga

Title and Telephone Number Director of Grant & Contract Svc.

Signature Wilma G Ennenga

Date Signed 11 June 2008

RECEIVED
JUN 11 2008
ARIZONA WATER PROTECTION FUND

EXECUTIVE SUMMARY

Sinclair Wash is a high profile ephemeral wash that runs through the south campus of Northern Arizona University within Flagstaff Arizona. Over the years, Sinclair Wash has been modified from its original alignment and vegetation subsequently removed to allow development and the installation of city utility lines (ie. sewer and reclaimed water). The project includes 3,000 feet of Sinclair Wash and a total project area of approximately 5 acres. A part of the Flagstaff Urban Trail System (FUTS) runs alongside the wash with one trail crossing. During times of flow, the crossing is often damaged or washed out, impairing stream function and contributing to non-point source pollutants that are transported downstream. Sinclair wash lacks the riparian community that it could support with some irrigation for plant establishment. The NAU and Flagstaff community have had long-time interest in enhancing Sinclair Wash for wildlife and people. The goal of this project is to increase channel function and stability of Sinclair Wash, enhance riparian vegetation, extend wildlife habitat corridors within the community, provide the opportunity to expand applied research into stream restoration, and use the process of restoration to teach the local community about riparian corridors and their importance. In the future, during a potential second phase, the City of Flagstaff aims to continue these project goals on their adjacent downstream property. The project includes a large and diverse set of interested parties who have committed substantial time, energy, and resources to the project. The project will help to link several other riparian wildlife areas in the Flagstaff area (see Regional Map, Page 10) Two projects (Arboretum at Flagstaff Wetland Enhancement Project, #06-136WPF and Picture Canyon Meander Restoration Project, #07-141WPF) are located upstream and downstream of the Sinclair Wash project. This project is consistent with efforts by the City of Flagstaff and Arizona Department of Game and Fish to provide a greenway, open space network of wildlife corridors through the urban area. A new design for the existing pedestrian trail crossing will be developed and submitted to the City for their future plans to reduce disturbances to the stream channel and local erosion and scour. The project is a collaboration of several entities including Northern Arizona University (NAU), departments within the university including Biology, Environmental Science, Geology, and Forestry, Willow Bend Environmental Education Center, the Ecological Monitoring and Assessment Program (EMA), Arizona Game and Fish Department, and the Audubon Society. The City of Flagstaff is a strong supporter of the project and in the near future the potential exists to formulate a city inter-departmental Task Force to continue stream enhancement downstream on City of Flagstaff property. The Sinclair Wash Enhancement Project will be used as an outdoor laboratory and will provide many opportunities for incorporation into the curriculums of the engineering, forestry, geology, biology, and environmental science departments within the College of Engineering and Natural Science at NAU. As part of the project outreach, Willow Bend Environmental Education Center plans to conduct class presentations, field visits, and larger educational events for primary and secondary school students. EMA plans to hold events for adults and the community at large. The project also provides a unique opportunity to provide refugia and a laboratory for applied research into the genetic and physical characteristics of native riparian species. The Merriam-Powell Center for Environmental Research and the Cottonwood Ecology Group is enthusiastic about the project and can provide support and assistance as long-term stewards. The group is interested in using relict narrow leaf cottonwood and willow propagated from isolated stands throughout the rim county to enhance Sinclair Wash. These relict stands (often as few as 5 trees, all from the same clone) are often found at the edge of a natural spring and have survived the drying out of the West since the retreat of the glaciers 10,000 years ago. The cottonwood trees used for this project will be relict cottonwood and rare willow species. In this way, the group will benefit by being able to study the trees into the future on the NAU campus. Lastly, Sinclair wash will also act as filter for stormwater that drains regularly through the wash. The willows and other shrubby vegetation will slow and spread flows allowing the uptake of minerals, heavy metals, and other impurities from groundwater. The City of Flagstaff looks upon this project as a great opportunity to lesson impacts from stormwater run-off. Natural Channel Design, Inc. has much experience working in ephemeral systems and will sub-contract with the grantee to provide technical expertise and services to help the project realize high success.

PROJECT OVERVIEW

Background

Sinclair Wash is a high profile ephemeral wash that runs through the south campus of Northern Arizona University within Flagstaff, Arizona. The Flagstaff Urban Trail System runs along the wash and is a major route utilized by walkers and biking commuters each day. Over the years, Sinclair Wash has been modified from its original alignment and vegetation subsequently removed to allow development and the installation of city utility lines (ie. sewer and reclaimed water). Thus, Sinclair Wash lacks the riparian community that it could support with some aid for plant establishment. The NAU and Flagstaff community have had long-time interest in enhancing Sinclair Wash for wildlife and people. The goal of this project is to enhance increase channel function and stability of Sinclair Wash, enhance riparian vegetation, extend wildlife habitat corridors within the community, provide the opportunity to gain expand applied research into stream restoration, and use the process of restoration to teach the local community about riparian corridors and their importance. There is also potential to form a Task Force with the appropriate City of Flagstaff departments to continue wash enhancement on City property directly downstream of the current project area in the future. This project aims to supply a concept plan to the City to give them an idea of what enhancements could occur on the downstream segment of Sinclair Wash. The project includes a large and diverse set of interested parties who have committed substantial time, energy, and resources to the project. The project will serve as a model for other riparian restoration projects within and around Flagstaff, and in the future can provide a source of plant materials for other projects. This project will also help inform the community and managers about how to treat riparian corridors as our small city grows.

This project will increase stream function; increase associated riparian habitat, and increase green space connectivity along Sinclair Wash in Flagstaff. The project will help link several other riparian wildlife areas in Flagstaff (see Regional Map, Page 10) Two projects (Arboretum at Flagstaff Wetland Enhancement Project, #06-136WPF and Picture Canyon Meander Restoration Project, #07-141WPF) are located upstream and downstream of the Sinclair Wash project (see Regional Map, page 12). This project is consistent with efforts by the City of Flagstaff and Arizona Department of Game and Fish to provide a greenway, open space network of wildlife corridors through the urban area. Currently native and non-native grasses, forbs, and annuals dominate the ephemeral channel. The project will increase the extent, diversity, and structure of the riparian community with the addition of native willows, cottonwoods, and shrubs. Supplemental irrigation using reclaimed water will be provided to establish plantings. Because the objective is to establish a self-sustaining riparian community, supplemental irrigation is considered temporary. However, the infrastructure and water will be available to augment established plantings during drought periods. A new design for the existing pedestrian trail crossing will be developed and supplied to the city to reduce disturbances to the stream channel and local erosion and scour. A concept plan for downstream City property will help aid the City of Flagstaff in their efforts to improve Sinclair Wash in the future.

This project will directly educate and affect students and citizens of Northern Arizona. The project is a collaboration of several entities including Northern Arizona University (NAU), departments within the university including Biology, Environmental Science, Geology, and Forestry, Willow Bend Environmental Education Center, Ecological Monitoring and Assessment Program, and Arizona Game and Fish Department. The Sinclair Wash Enhancement Project will be used as an outdoor laboratory and provides many opportunities for incorporation into the curriculums of the engineering, forestry, geology, biology, and environmental science departments within the College of Engineering and Natural Sciences at NAU. Thus, the outstanding education, monitoring, and maintenance efforts that will be the result of this project will last for much longer than the short duration of the grant life. The curriculums and research studies that will result from this project have the potential to inform managers, practitioners, and the public about riparian corridors and useful information that will lead to even greater restoration efforts in the future.

On a community level, the education for this project will be just as far reaching. As part of the project outreach, Willow Bend Environmental Education Center plans to conduct class presentations, field visits, and larger educational events for primary and middle school students. The Center has a rich, thirty-year history of providing place-based environmental education that fosters an ethic of stewardship and responsibility by deepening people's understanding of and connections to nature. Willow Bend provides educational programs that empower people to make mindful choices in their daily lives that are healthier for themselves, for communities, and for the earth. Each year, Willow Bend serves more than 25,000 people in northern Arizona. In the past six years they have won six environmental education awards including being recognized by the North American Association of Environmental Educators as the best local Environmental Education Center in the country in 2007. Willow Bend's niche is taking their hands-on programs into the classrooms at local schools. They teach over 650 classroom programs each year in Flagstaff, Williams, Parks, and Fredonia. With a repertoire of more than 45 classroom programs, they cover a wide range of environmental and science topics relating to the local environment and reach over 16,000 students each year. They will be a major asset in disseminating information about the grant project and educating students and the community about riparian restoration in the state of Arizona.

Additionally, the Ecological Monitoring & Assessment Program (EMA) & Foundation will be involved in outreach and education for adult and community events to connect Flagstaff with its watershed. The program is an innovative partnership between Northern Arizona University and Babbitt Ranches. It was established in 2002 by the Presidents of Northern Arizona University and Babbitt Ranches to institute a new model for resource stewardship. The NAU/EMA partnership has united the research resources of a world-renowned environmental institution with the intimate knowledge of the land from a conservation-oriented ranching family. The relationship has provided the foundation for use-inspired research to understand and sustain the lands of the Southwest. EMA plans to conduct 5 events that will include lectures and Sinclair Wash clean-up days with the goal of increasing interest and the understanding of watershed/urban interfaces.

In addition, this project will directly forward the science of riparian restoration. The project provides a unique opportunity to provide refugia and a laboratory for applied research into the genetic and physical characteristics of native riparian species. The Merriam-Powell Center for Environmental Research and the Cottonwood Ecology Group at NAU is enthusiastic about the project and can provide support and assistance as long-term stewards. The group is interested in using relict narrow leaf cottonwood and willow propagated from isolated pockets throughout the rim county. These relict stands (often as few as 5 trees, all from the same clone) are often found at the edge of a natural spring and have survived the drying out of the West since the retreat of the glaciers 10,000 years ago. Many populations are down to a single tree, with a few progeny that have sprouted from the roots to form a small clone all of the same sex (sexes are separate in these trees). As a result they can no longer sexually reproduce because potential mates are too far away. With predicted climate change and ongoing droughts, many of these relicts have a high probability of going extinct if they stay isolated. However, since they have survived in changing conditions this far, it also suggests that they have the genetic make-up as hardy trees. Additionally, the research of this group has shown that these trees support a specific diverse community of microbes to vertebrates numbering about 1,000 species, many of which are not found on surrounding vegetation. Thus, their loss would result in a loss of a much larger community. There is great conservation and education value in protecting these relicts of riparian areas, as they are the last-of-the-last. By planting them on University grounds under the protection of many watchful eyes, they will be an important education tool that will teach students of all ages about riparian communities as hotspots of biodiversity, the importance of maintaining relict populations, and the potential devastating impacts of climate change on the environment. Importantly, once established, these protected trees and shrubs can then be used as propagation stock for other restoration efforts throughout the high country.

The Cottonwood Ecology Group has a vested interest in survivorship of these plantings and are committed to long-term monitoring. The group has planted over 30,000 cottonwoods and willows at restoration sites in Arizona and Utah. Although site conditions vary greatly, >90% of these plantings have survived over the years and unsuccessful plantings are always replaced. Understanding long-term drought survivorship will help future restoration biologists deal with one of the most important issues of our time; the maintenance of biodiversity in the face of climate change. The research/education value of having an 'in house' laboratory at Northern Arizona University would be indispensable. Approximately 560 cottonwood trees and about 2,250 willows are planned to be planted. As the design phase starts, a more precise number will be established. Photos of a 13 year old cottonwood 'garden' tended by this group and used for recreation and research, is located in the Supplemental Information attachment (Figures 1-3).

Lastly, Sinclair wash will also act as filter for stormwater that drains regularly through the wash (Figure 4). The willows and other shrubby vegetation will slow and spread flows allowing the uptake of minerals, heavy metals, and other impurities from groundwater. The City of Flagstaff looks upon this project as a great opportunity to lesson impacts from stormwater run-off. Adding vegetation will also slow and spread run-off, lowering flood impacts to utilities, trails, roads and other infrastructure that currently exists within the project area and downstream of the site.

Project Site Description

Sinclair Wash is an ephemeral, tributary stream to the Rio de Flag. The proposed project area runs from Milton Road to San Francisco Street, within Flagstaff city limits (see Project Reach Map, Page 14). Through this reach, Sinclair Wash lies completely within one property owner, Northern Arizona University (applicant). The project includes 3,000 feet of Sinclair Wash and a total project area of approximately 5 acres. The Sinclair Wash corridor is surrounded by infrastructure, especially in the upstream end of the project area and has been narrowed and straightened from its historic alignment in some areas to allow development (see Overview Map, Page 13). Immediately adjacent to the channel in this reach is a large non-vegetated slope owned by NAU that contributes much run-off and sediment to the stream (Figure 5). A part of the Flagstaff Urban Trail System (FUTS) runs alongside the wash with one trail crossing. During times of flow, this crossing is often damaged or washed out, impairing stream function and contributing to non-point source pollutants that are transported downstream (Figure 4). The crossing receives regular maintenance, requiring money and time. Currently, native and non-native grasses dominate the channel with little diversity in riparian species or plant structure available for wildlife habitat. Many exotic weed species are present (Figure 6). A single cottonwood grows next to the channel in the middle of the project area (Figures 7-8). Colonies of native willows exist half a mile, downstream of the project site that indicates this wash can support riparian vegetation (Figures 9-10).

Goals

The goal of the project is to enhance and restore native riparian vegetation, biological, and physical resources of the riparian corridor of Sinclair Wash through the project area. The enhancement of these resources is expected to directly benefit humans and wildlife dependent on river, stream, and riparian resources while educating the community about Flagstaff's watershed and importance of ephemeral channels.

Objectives

1) Increase the stability of the stream channel while maintaining the natural dynamic stream processes. These processes require proper hydrologic function, stream geomorphology, and channel/floodplain function.

2) Enhance the species and structural diversity of native riparian vegetation along this reach of Sinclair Wash through noxious weeds management and native plantings. An increase in the quantity and quality of native riparian vegetation is expected to enhance wildlife habitat through increased diversity and richness.

3) Develop curriculum, workshops, and field trips that focus on Sinclair Wash, riparian corridors, and stream restoration to educate children, adults, college students, and families about the importance of these natural resources.

4) Advance the science of restoration while simultaneously re-vegetating the project site by creating refugia for relict cottonwoods for future research and restoration purposes.

5) Provide an example of stream enhancement and restoration for other landowners in the Flagstaff area.

Statement of Problems

1) This section of the wash has been highly modified during development of the University and City road and utility infrastructure. The result is a vegetation community composed of low herbaceous species that lacks the structure and diversity for high quality wildlife habitat. The Flagstaff Urban Trail System (FUTS) crosses Sinclair Wash at one point within the project area. The crossing consists of small culverts to carry low flows and a low profile that allows larger flows to pass over the trail. However, the shape of the crossings tends to spread flows during floods creating channel instability and erosion below each crossing. This instability and associated erosion reduces stream function and plant establishment as well as increasing maintenance costs.

2) The value of ephemeral stream systems is often not apparent to the general public. As a result, valuable riparian areas are not adequately protected. This lack of appreciation often results in local and regional decisions that negatively impact riparian corridors.

3) The knowledge of stream restoration in the arid Southwest is limited. This is especially true for the specially adapted riparian species of the region. Applied research that can increase the success and decrease the failures of riparian projects is valuable.

Statement of Solutions

1) Wildlife habitats will be restored and enhanced throughout the project area by planting a variety of native riparian plant communities along the stream channel and overbank areas. These communities include local willows (*Salix lasiolepis*) and Narrowleaf cottonwood (*Populus angustifolia*) as well as a variety of native shrub species. Plantings will focus on deeper-rooted woody shrub species that will find sufficient soil moisture once established and can provide species and structural diversity to the project area. Reclaimed water will be used to establish plantings. The objective is to create a largely self-maintaining riparian community. However, irrigation infrastructure and water will be available during drought periods especially for the cottonwood refugia. The crossing will be designed to minimize impacts to the stream channel and reduce the need for routine maintenance. If the new design is implemented, the trail crossing will provide a positive example for other parts of the City. In addition, a concept plan for a segment of Sinclair Wash directly downstream of the project site will be developed to aid the City of Flagstaff in their continued efforts to provide green space and functioning habitat corridors within city limits.

2) Due to its urban nature public outreach will be an important component of the project. The area is visited by hundreds of citizens on foot and bicycle each day along the FUTS trail system. The project lies within the South campus of Northern Arizona University. Interpretive signs within the project will help to educate visitors. In addition the project area will be integrated into the curriculum of public schools and university. Several colleges currently support the project and plan to integrate it into their curriculum. Willow Bend Environmental Center, located along the Rio de Flag downstream of the project, plans to include the project and its educational programs for primary, middle, and high schools. The Ecological Monitoring and Assessment Program will educate the adult community about riparian areas and the local watershed.

3) The project will be a unique opportunity to provide a long-term refugia and research laboratory to study riparian vegetation. The riparian plantings, in addition to providing habitat, recreation, aesthetics, and educational benefits, will allow the on-going study of high altitude cottonwood populations, locate drought tolerant and hardy genotypes, and establish refugia for cottonwoods in the face of so many climatic changes.

Statement of Project Years of Benefit

Because the project attempts to restore a natural and self-maintaining equilibrium to the project area, it is expected that the benefits to riparian resources and related wildlife habitat of Sinclair Wash will extend for a period of more than 25 years.

Project Location & Environmental Contaminant Information
FY 2009

Project Location Information			
1. County: Coconino	2. Section: 21	3. Township: 21N	4. Range: 7E

5. Watershed: Little Colorado River
6. Name of USGS Topographic Map where project area is located: AZ Flagstaff West Quad
7. State Legislative District: 2

(Information available at http://156.42.40.10/mapping/default2.asp?tname=Interim.2004.Legislative.Map)

8. Land ownership of project area: Northern Arizona University
9. Current land use of project area: Open space on campus with trail system
10. Size of project area (in acres): 5
11. Stream Name: Sinclair Wash
12. Length of stream through project area: 3000 feet
13. Miles of stream benefited: 0.57 miles
14. Acres of riparian habitat: 5 acres will be:

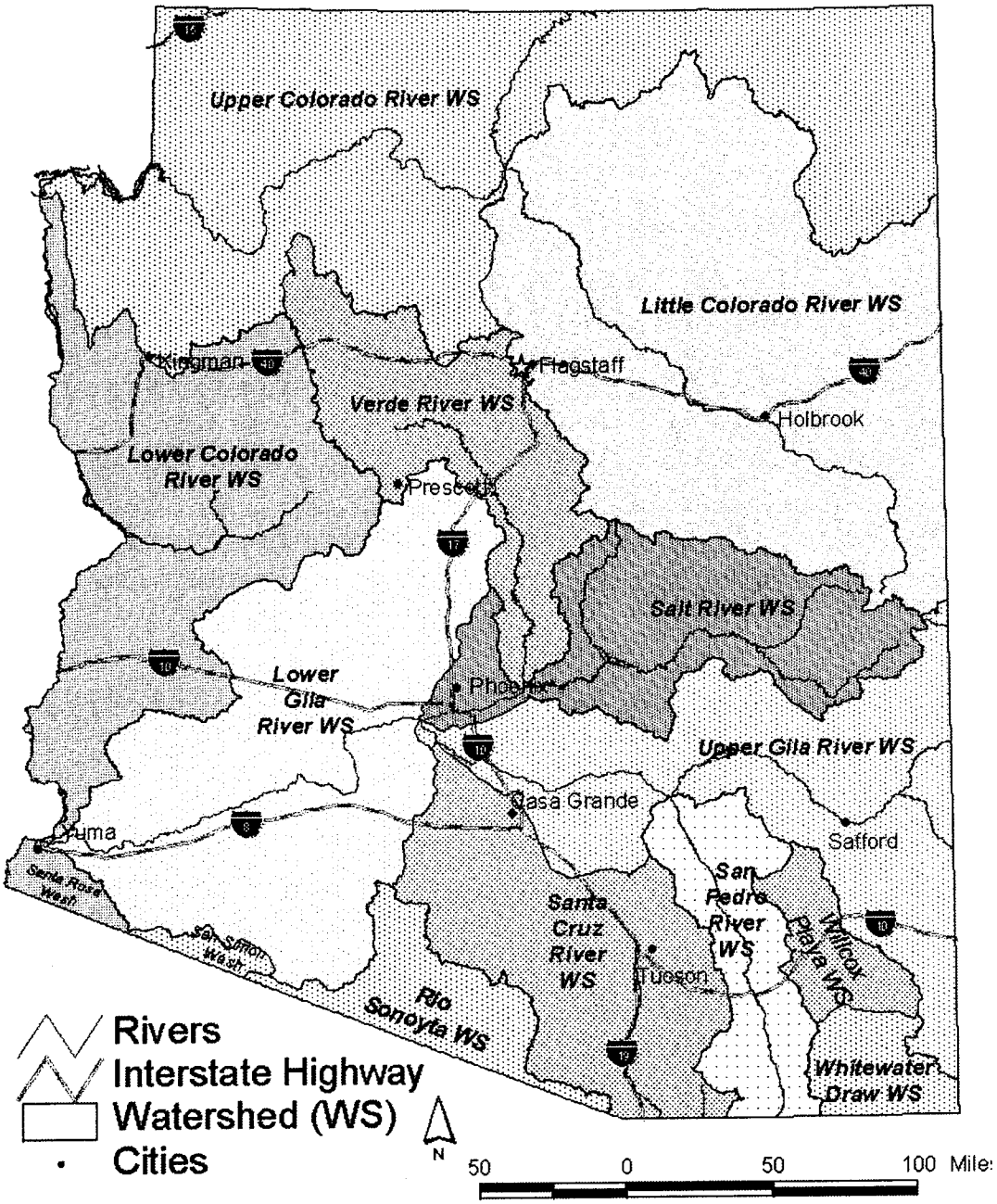
☒ Enhanced
☐ Maintained
☐ Restored
☒ Created

15. Provide directions to the project site from the nearest city or town. List any special access requirements:
While traveling north on Interstate 17 take the McConnell Dr exit (EXIT 341) at the outskirts of Flagstaff. At the stop sign, the project area begins across the street. Turn right to enter the NAU campus, Sinclair Wash runs along the north side of McConnell Dr for about 0.6 miles to the intersection at San Francisco St.

Environmental Contaminant Location Information

1. Does your project site contain known environmental contaminants? ☐**YES** ☒**NO** If yes, please identify the contaminant(s) and enclose data about the location and levels of contaminants:
   •
2. Are there known environmental contaminants in the project vicinity? ☐**YES** ☒**NO** If yes, please identify the contaminant(s) and enclose data about the location and levels of contaminants:
   •
3. Are you asking for Arizona Water Protection Fund monies to identify whether or not environmental contaminants are present? ☐**YES** ☒**NO**

Arizona Watershed Map
FY 2009



Title of Project: Sinclair Wash Riparian Enhancement Project

Project Location/Ownership Maps

11 x 17 Regional Map

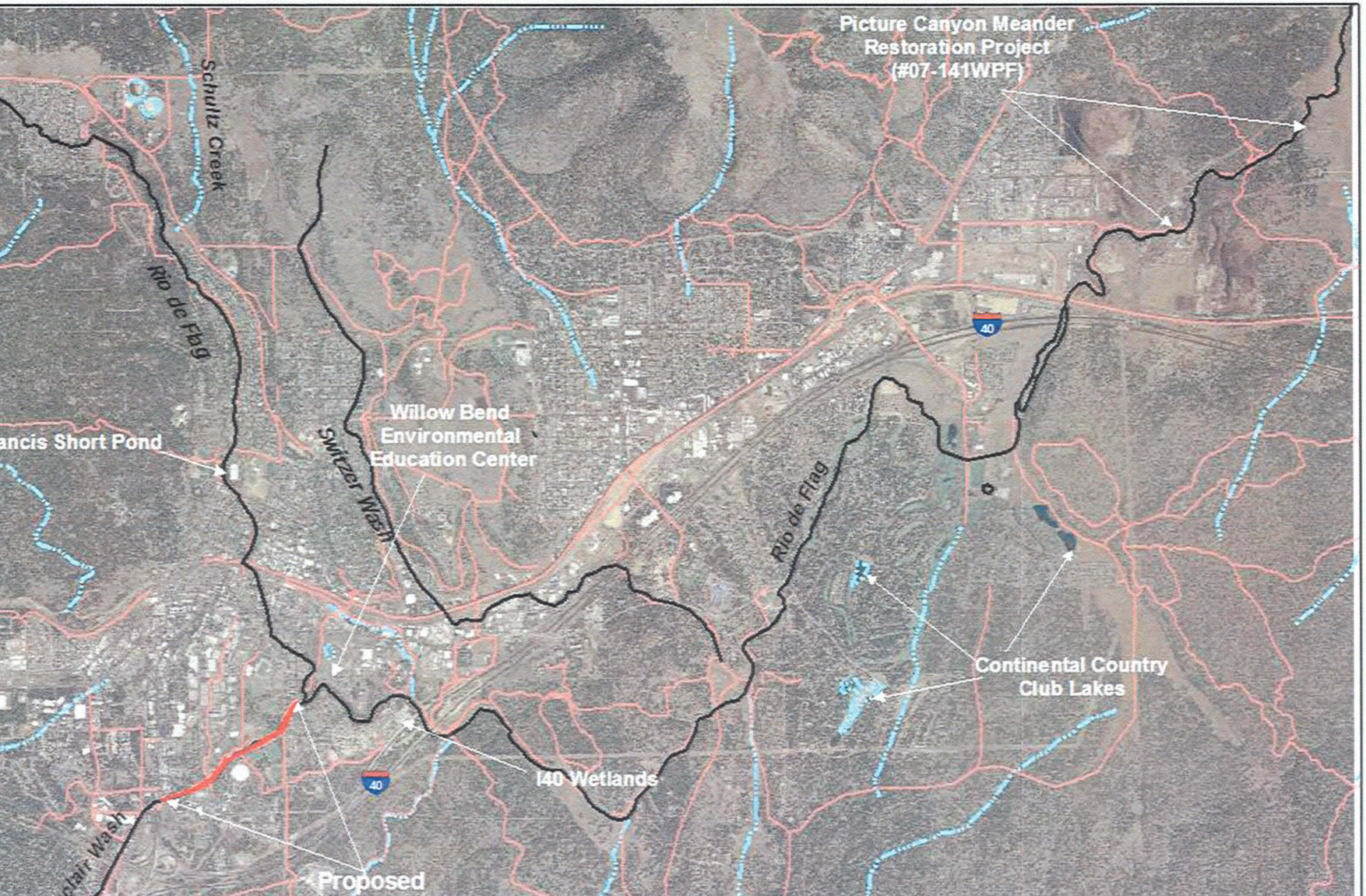
Greater Flagstaff area displaying other riparian restoration projects.

els

Proposed Sinclair Wash Riparian Enhancement Project

0 0.45 0.9 1.8
Miles

N



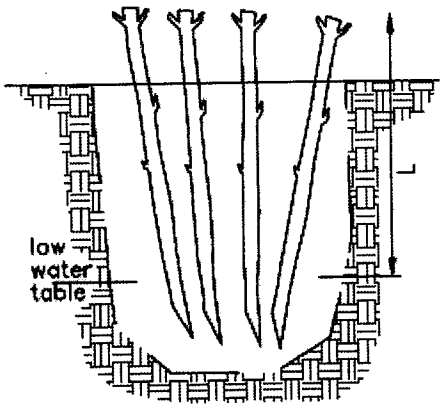
11 x 17 Project Overview Map

Project Area = 5 acres
Concept Plan Area = 8.5 acres

S. San Francisco St
Lone Tree Rd
COF Property
NAU Property
NAU
Skydome
CONCEPT PLAN REACH

11 x 17 Project Reach - NAU Property

NAU Property
S. San Francisco St
NAU
Skydome
Knoles Dr
ossing #1
A
A
A
A



POLE CLUSTERS

NOTES
Use 1/2–2 in. cuttings.
In holes excavated with an auger, place approximately 4 cuttings in hole to maximize sprouting success. Holes are backfilled with excavated material and watered.

NOTES

1. Cuttings shall be dormant, stripped of side branches, and soaked 3 to 7 days.
2. Cuttings shall be 3/4 to 2 inches in diameter and typically 3–6 stems per bundle or cluster.

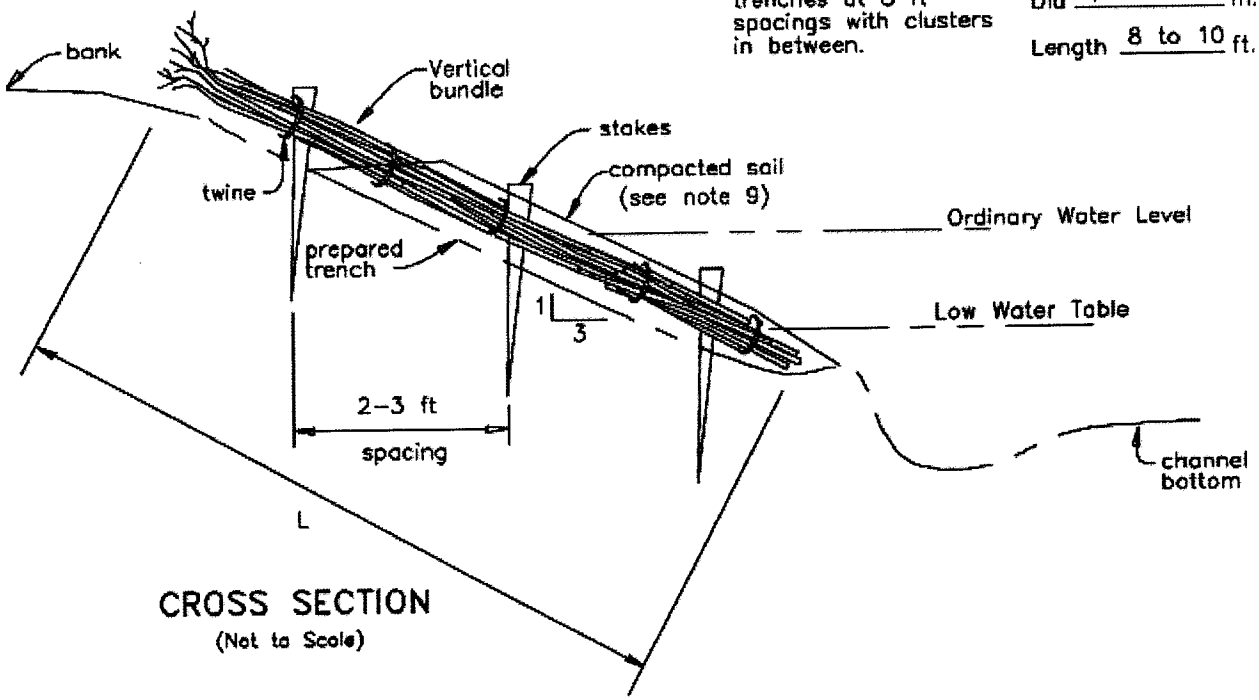
VERTICAL BUNDLES

1. Bundles shall be tied with untreated twine about every 2 feet.
2. Excavate a vertical trench with a slope of 3:1 or more in the streambank.
3. Make sure the bottom of the trench will still be under water during low flows.
4. The trenches should be excavated on 4 foot centers alternating with willow clusters to ensure adequate protection and to encourage rapid growth to fill in the bank.
5. Place bundle in the trench with the cut ends in the water.
6. Secure bundles to back of trench with wooden stakes at about 3 foot spacings.
7. "Muddy" in bundles with water and soil (covering the bundles 1 to 2 inches deep)
8. Leave approximately 30 percent of upper branches exposed.
9. Tops of cuttings are cut off after placement.

VERTICAL BUNDLES

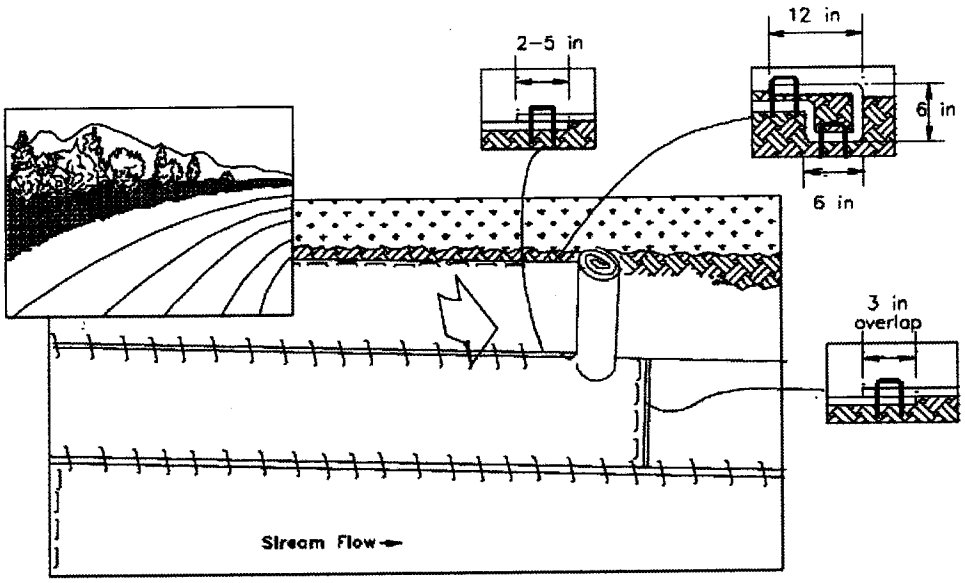
Dormant native poles placed in shallow trenches at 8 ft spacings with clusters in between.

Species Willows
Dia 1/2 to 2 in.
Length 8 to 10 ft.

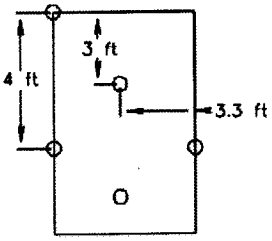


CROSS SECTION
(Not to Scale)

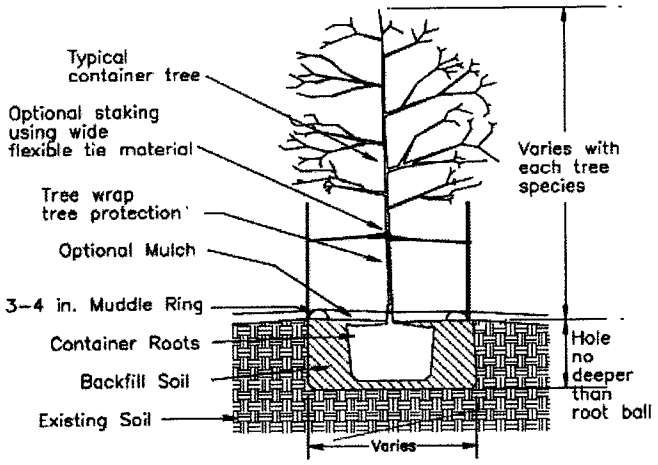
VERTICAL BUNDLES



EROSION CONTROL FABRIC: SLOPE INSTALLATION
NOT TO SCALE

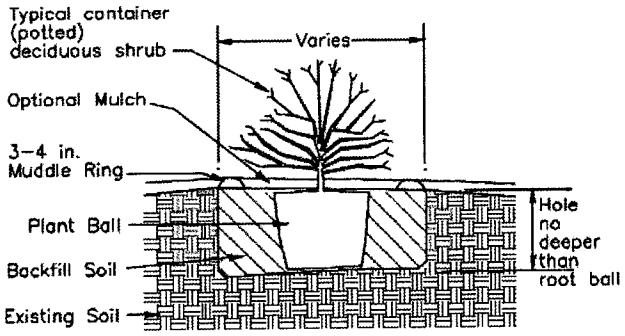


STAPLE PATTERN



CONTAINER/POTTED DECIDUOUS TREE DETAIL

NOTE: Prune shrub as recommended by grower only after the plant has been watered in to the planting soil



CONTAINER SHRUB PLANTING DETAIL

SCOPE OF WORK

Task #1: Permits, Authorizations, Clearances, and Agreements

Task Description: The Grantee shall obtain and submit to the project manager copies of all necessary permits, authorizations, clearances and agreements, and perform any consultations required to complete the tasks listed in the Scope of Work including but not limited to:

1. Sub-contractor agreements:
    a. Natural Channel Design, Inc.
    b. Archaeologist
    c. Willow Bend
    d. Ecological Monitoring and Assessment Program
    e. Cottonwood Ecology Group
    f. Heavy Equipment Operator
2. Cultural resource clearance (SHPO)
3. Archaeological survey
4. Clean Water Act Section 404 permit from ACOE
5. Clean Water Act Section 401 permit from ADEQ, if necessary
6. Herbicide use permit
7. COF grading permit, if necessary
8. Water rights documents and water use agreements, if necessary
9. Floodplain Use permits, if necessary

Since Sinclair Wash is an urban, ephemeral stream system, a Section 7 consultation with the U.S. Fish and Wildlife Service is not expected.

All permits and authorizations will be obtained and submitted to the Project Manager prior to any ground disturbing work.

Task Purpose: To comply with all local, state, and federal permit requirements, environmental laws and obtain legal documentation to access and conduct work in the project area.

Deliverable Description: Various Permits and Agreements as Described Above

Deliverable Due Date: (1) Prior to initiation of sub-contracted work
(2)-(9) Prior to any ground disturbing activities

AWPF Reimbursable Cost: $17,639

Task #2: Prepare and Implement Site Assessment Plan

Task Description: The grantee shall develop and submit a Site Assessment Plan. The Plan shall describe in detail, the proposed site assessment methodologies and activities associated with riparian vegetation, channel geomorphology, channel/floodplain function, stream bank stability and sediment transport conditions at the project area and the concept plan area directly downstream. The plan shall address the proposed assessment activities that will take place within the project area including, but not limited to:

- Evaluation of the hydrology, hydraulics, and morphology of the channel/floodplain,
- Evaluation of the existing riparian vegetation,
- Local reference conditions for the resources described above
- List of all necessary equipment
- List of data to be collected and the rationale for its collection.

A topographic survey of the project area will be performed. The Plan shall be structured to provide the Grantee with critical design parameters. The results from the Site Assessment Plan activities will be included in Task #3, Development of Final Design, Weed Management, and Re-vegetation Plan.

Site assessment activities for the Concept Plan area, downstream of the project area, will be less detailed and rely on aerial photography and data analyses from previously conducted inventories. The Site Assessment Plan shall address, in detail, the specific activities that will be associated with the concept plan area. The results from the Site Assessment Plan activities will be included in Task #10, Concept Plan for Future Phase II.

After the site assessment has been completed, a memo with photos documenting fieldwork will be submitted to the Project Manager to document that the assessment has been completed and re-imbursement is possible.

Task Purpose: To ensure critical design parameters are identified and utilized in the final design.

Deliverable Description: (1) Site Assessment Plan
(2) Memo reporting completion of Site Assessment

Deliverable Due Date: (1) April 30, 2009
(2) June 30,2009

AWPF Reimbursable Cost: $16,535

Task #3: Development of Final Design, Weed Management, and Revegetation Plan

Task Description: The grantee will prepare a Final Design Plan. Within the plan, a description and assessment of the existing conditions of the physical, biological components of Sinclair Wash and its riparian system within the project area will be included using the data gathered from the Site Assessment in Task #2. Also within the plan weed management, re-vegetation, and irrigation plans will be discussed.

The Design Plan will include, at a minimum:

- Narrative summarizing assessment activities
- Summary of site assessment inventory and evaluation conclusions
- Design report
- Construction specifications, design parameters, and engineering drawings
- Topographic Survey
- Restoration construction sequence and procedures
- Engineers cost estimate
- Materials and equipment list

- List of permits, clearances, agreements and authorizations necessary to implement this task
- Personnel responsible for completing the work
- Re-vegetation Plan including:
  - Discussion of existing vegetation, climate, soil, hydrologic conditions, planting zones, and species for re-vegetation
  - Maps or drawings to scale, clearly indicating areas to be seeded and revegetated
  - Materials and equipment list including plant and seed species and sources
  - Planting sequence and procedures
- Weed Management Plan including:
  - Map of weeds with in the project area
  - Method of removal, chemical or mechanical
  - Weed removal sequence and procedures
- Irrigation Management Plan including:
  - Design details and specifications for irrigation system
  - Watering schedule
  - Material and equipment list

The Final Design Plan will be reviewed and signed/stamped by a Professional Engineer licensed in the State of Arizona. The grantee shall obtain written approval from the Project Manager prior to implementation of the Design Plan.

Task Purpose: To describe stream channel restoration design, revegetation, weed management, and irrigation activities to be used to enhance and restore the function of the stream channel and provide information necessary to obtain a Clean Water Act 404 permit.

Deliverable Description: (1) Final Design, Weed Management, and Revegetation Plan

Deliverable Due Date: (1) September 30, 2009

AWPF Reimbursable Cost: $19,031

Task #4: Development of Monitoring Plan

Task Description: The Monitoring Plan shall describe the channel stability and geomorphology, vegetation survival and ground cover, wildlife, and photo point monitoring activities of the project. The Plan shall include provisions for baseline monitoring and annual monitoring throughout the contract period. The Monitoring Plan shall describe the specific monitoring schedule and timing for all aspects of the program. The Plan shall include at a minimum:

- Map(s) to scale of the project clearly showing the proposed monitoring sites
- Attributes to be measured, as well as frequency of monitoring
- Rationale for the number and location of monitoring points
- Procedures used to measure attributes and specific data analyses to be performed
- Monitoring benchmarks to supply a comparison between actual and proposed success
- Monitoring objectives
- Materials and equipment list
- Discussion of quality assurance/quality control
- Sample data sheets and photo point record sheets
- Personnel responsible for completion of the task

The grantee will obtain written approval from the Project Manager prior to implementation of the plan.

Task Purpose: To provide strategy and outline steps needed to accomplish monitoring in a timely and efficient manner.

Deliverable Description: (1) Monitoring Plan

Deliverable Due Date: (1) October 31, 2009

AWPF Reimbursable Cost: $9,433

Task #5: Development of Public Outreach and Education Plan

The **Public Outreach Plan** shall describe all activities to be performed for the duration of the project to inform and educate the public about the project including a kiosk and signage, on site workshops, field trips, classroom activities, bird watching events, and mailings and other press items to communicate project activities to the community. The Willow Bend Environmental Center will be very involved in developing curriculum for children in grades K-12, as well as adult education themes. The Merriam Powell Center Cottonwood Ecology Group at Northern Arizona University will use the Sinclair Wash project as an outdoor laboratory for cottonwood and willow studies. Other NAU departments will utilize the area for a wide array of educational purposes. The Ecological Monitoring and Assesment Program will host site visits and other workshops. Each group will be responsible for submitting their plans for inclusion in one comprehensive Public Outreach and Education Plan for the entire project. The plan will include, at a minimum:

- Description of proposed activity objectives and descriptions
- Each activity's target audience
- A description of each event and informational material to be produced
- Activity schedule
- Local paper press release(s)
- Map(s) to scale, clearly indicating placement of signage
- Proposed language and design to be included on signage

Task Purpose: To provide strategy and outline steps needed to accomplish public outreach and educational goals.

Deliverable Description: (1) Public Outreach and Education Plan

Deliverable Due Date: (1) November 15, 2009

AWPF Reimbursable Cost: $14,336

Task #6: Initial Construction, Weed Management, and Re-vegetation Effort

Task Description: The Grantee will perform all activities as described in the approved Project Design Plan submitted for Task #3 under the supervision of the Grantee's design engineer or designated representative. The grantee shall prepare and submit to the project manager an Initial Construction and Re-vegetation Report describing the earthwork, channel, construction, re-vegetation, weed management, and irrigation activities completed. The report will contain a brief narrative, representative photos, maps and 'as-built' drawings of the work completed. The task is expected to be completed in the late fall during the beginning of the dormant period for the riparian vegetation.

Task Purpose: To implement the project design and document the construction process.

Deliverable Description: (1) Initial Construction/Re-vegetation Report

Deliverable Due Date: (1) November 15, 2010

AWPF Reimbursable Cost: $81,895

Task #7: Additional Construction, Weed Management, and Re-vegetation Efforts

Task Description: The Grantee will assess the success of the Initial Construction/Re-vegetation efforts and identify additional practices necessary to project success. There may be unforeseen damage from high flows, failure of some re-vegetation areas, or the need for installation of additional structures or bioengineering. A Final Construction Activities Design will be prepared that describes the practices planned for Task #7, Additional Construction/Re-vegetation. Task #7 activities are expected to be much less extensive than those in Task #6, Initial Construction/Re-vegetation.

Additional Construction/Re-vegetation will take place in the fall of 2011. Activities are expected to be limited to repair and/or additional activities described in the Design Plan. The work will take place under the supervision of the design engineer or a designated representative.

An Additional Construction/Re-vegetation Report will be prepared and submitted to the AWPF Program Manager at the conclusion of this task in 2011. In following years, if additional work is completed a report will be submitted.

Task Purpose: To evaluate the success of the initial construction effort, to prepare a detailed design plan for additional construction activities and implement practices to meet project objectives.

Deliverable Description: (1) Annual Construction/Re-vegetation Reports
(2) Summary narrative and analysis of construction and re-vegetation activities in Final Report

Deliverable Due Date: (1) November 15, 2011, November 15, 2012 (optional), November 15, 2013 (optional)
(2) March 31, 2014

AWPF Reimbursable Cost: $27,788

Task #8: Conduct Monitoring

Task Description: The grantee shall implement the approved monitoring plan submitted as part of Task #4 in order to evaluate the various components of this project. The grantee shall prepare and submit to the project manager one Baseline Monitoring Report in addition to Annual Monitoring Reports, which shall include a brief narrative of work completed under this Task, description and analysis of all data collected, a map and GPS locations of all monitoring sites, photo point records and photographs. Final analysis and reporting of all monitoring activities shall be included in the Final Report. In general, it is expected that monitoring of channel geomorphology and riparian vegetation will take place in the early fall of each year after monsoon season.

Task Purpose: To monitor the success of the restoration efforts and their effectiveness at meeting AWPF and project goals.

Deliverable Description: (1) 2010 Baseline Monitoring Report
(2) 2011 Annual Monitoring Report
(3) 2012 Annual Monitoring Report
(4) 2013 Annual Monitoring Report
(5) Summary narrative and analysis of monitoring activities in the Final Report

Deliverable Due Date: (1) October 31, 2010
(2) October 31, 2011
(3) October 31, 2012
(4) October 31, 2013
(5) March 31, 2014

AWPF Reimbursable Cost: $49,405

Task #9: Public Outreach and Education Implementation

Task Description: The Grantee's partners will conduct Public Outreach activities as described in the Public Outreach Plan in Task #5. The grantee shall complete a Public Outreach Report that shall include a description of each activity performed, representative photographs, copies of the material produced, and attendance lists. Willow Bend will lead field trips and teach classroom programs that will further students' understanding of native plants and vegetation and the Sinclair Wash Enhancement project. Willow Bend will also work with Ecological Monitoring and Assessment Group (EMA) to host a series of community events involving the Enhancement Project. Willow Bend is located within 1/2 mile of the Enhancement Project and will serve as the central meeting place for community outreach events coordinated by EMA. Willow Bend will oversee the publicity for each event (posting fliers around town, emailing our list serve, and notifying our PR contacts at the newspaper, radio, visitor's bureau, etc). At the conclusion of this task, a narrative report will be submitted to the AWPF Program Manager that includes all materials prepared for distribution, invitee list, attendance list, photographs, and copies of invoices or receipts. A summary of Public Outreach activities will be included in the Final Report.

Task Purpose: To report activities and evaluate the success of public outreach efforts associated with the project

Deliverable Description: (1) Public Outreach Reports
(2) Summary of narrative of public outreach activities in the Final Report

Deliverable Due Date: (1) Each year on January 31st, from 2010 to 2014
(2) March 31, 2014

AWPF Reimbursable Cost: $49,303

Task #10: Concept Plan for Future Phase II

Task Description: The Grantee shall prepare and submit a concept plan for the City of Flagstaff property located directly downstream of the project area. The concept plan report shall include preferred enchancement techniques and alternatives that were considered. Diagram, illustrations, and schematics displaying enhancement techniques and locations will be included. Information from the site assessment in Task 2 and lessons learned during the course of the implementation of the project upstream will be used to inform the plan.

Task Purpose: To describe the possible enhancements that could continue downstream of the project area on City of Flagstaff property.

Deliverable Description: (1) Phase II Concept Plan

Deliverable Due Date: (1) February 28, 2014

AWPF Reimbursable Cost: $12,189

Task #11: Final Project Report

Task Description: The Grantee shall prepare and submit a comprehensive final report. The final report shall include a summary of all methodologies used, outcomes of all Tasks, analysis of all Project data, suggestions for any changes or future actions, and an evaluation of the success of meeting Project objectives. The Grantee shall provide all data generated under this Contract, unless otherwise specified in the Special Provisions.

Task Purpose: To describe the goals and accomplishments of the project.

Deliverable Description: (1) Final Project Report

Deliverable Due Date: (1) March 31, 2014

AWPF Fixed Cost: $11,836

Timeline Summary

TIMELINE

Sinclair Wash Enhancement Project

Bold characters denote deliverable due dates

YEAR 1: 2009

Task	JAN 1	FEB 2	MAR 3	APR 4	MAY 5	JUNE 6	JULY 7	AUG 8	SEPT 9	OCT 10	NOV 11	DEC 12
1 Permits, Authorizations, Agreements									X	X	X	X
2 Prepare & Implement Site Assessement Plan				X	X	**X**	-	-	-	-	-	-
3 Development of Final Design						X	X	X	**X**	-	-	-
4 Development of Monitoring Plan									X	**X**		
5 Development of Public Outreach & Education Plan										X	**X**	
6 Initial Construction												
7 Additional Construction												
8 Conduct Monitoring												
9 Public Outreach and Education Implementation												
10 Final Report												

YEAR 2: 2010

Task	JAN 1	FEB 2	MAR 3	APR 4	MAY 5	JUNE 6	JULY 7	AUG 8	SEPT 9	OCT 10	NOV 11	DEC 12
1 Permits, Authorizations, Agreements					COMPLETED							
2 Prepare & Implement Site Assessement Plan					COMPLETED							
3 Development of Final Design					COMPLETED							
4 Development of Monitoring Plan					COMPLETED							
5 Development of Public Outreach & Education Plan					COMPLETED							
6 Initial Construction									X	X	**X**	
7 Additional Construction												
8 Conduct Monitoring										B		
9 Public Outreach and Education Implementation	R				ONGOING							
10 Final Report												

R PO/E report B Baseline monitoring

YEAR 3: 2011

Task	JAN 1	FEB 2	MAR 3	APR 4	MAY 5	JUNE 6	JULY 7	AUG 8	SEPT 9	OCT 10	NOV 11	DEC 12
1 Permits, Authorizations, Agreements					COMPLETED							
2 Prepare & Implement Site Assessement Plan					COMPLETED							
3 Development of Final Design					COMPLETED							
4 Development of Monitoring Plan					COMPLETED							
5 Development of Public Outreach & Education Plan					COMPLETED							
6 Initial Construction					COMPLETED							
7 Additional Construction									X	X	**X**	
8 Conduct Monitoring										2		
9 Public Outreach and Education Implementation	R				ONGOING							
10 Final Report												

R PO/E report 2 2nd year monitoring

YEAR 4: 2012

Task	JAN 1	FEB 2	MAR 3	APR 4	MAY 5	JUNE 6	JULY 7	AUG 8	SEPT 9	OCT 10	NOV 11	DEC 12
1 Permits, Authorizations, Agreements					COMPLETED							
2 Prepare & Implement Site Assessement Plan					COMPLETED							
3 Development of Final Design					COMPLETED							
4 Development of Monitoring Plan					COMPLETED							
5 Development of Public Outreach & Education Plan					COMPLETED							
6 Initial Construction					COMPLETED							
7 Additional Construction									X	X	**X**	
8 Conduct Monitoring										3		
9 Public Outreach and Education Implementation	R				ONGOING							
10 Final Report												

R PO/E report 3 3rd year monitoring

YEAR 5: 2013

Task	JAN 1	FEB 2	MAR 3	APR 4	MAY 5	JUNE 6	JULY 7	AUG 8	SEPT 9	OCT 10	NOV 11	DEC 12
1 Permits, Authorizations, Agreements					COMPLETED							
2 Prepare & Implement Site Assessement Plan					COMPLETED							
3 Development of Final Design					COMPLETED							
4 Development of Monitoring Plan					COMPLETED							
5 Development of Public Outreach & Education Plan					COMPLETED							
6 Initial Construction					COMPLETED							
7 Additional Construction									**X**	**X**	**X**	
8 Conduct Monitoring										X	**X**	
9 Public Outreach and Education Implementation	R				ONGOING							
10 Final Report; 2014												**X**

R PO/E report 4 4th year monitoring

Detailed Budget

Task 1. Permits, Authorizations, Clearances, and Agreements
To comply with all local, state, and federal permit requirements, environmental laws and obtain legal documentation to access and conduct work in the project area.

Direct Labor Costs	Estimated quantity		$/unit	Total Cost	5% Overhead	TOTAL TASK COST	% of Budget
NCD Civil Engineer	10	hrs	$95.00	$950.00			
NCD Riparian Ecologist	60	hrs	$75.00	$4,500.00			
NCD Engineering Technician	10	hrs	$75.00	$750.00			
NAU Project Coordinator	100	hrs	$50.00	$5,000.00			
Archeologist	60	hrs	$85.00	$5,100.00			
			SUBTOTAL	**$16,300.00**			
Direct Costs: Supplies, Printing, Postage, Travel, etc	Estimated quantity		$/unit	Total Cost			
Subcontractor Agreements	30	pages	$0.15	$4.50			
SHPO Clearance	30	pages	$0.15	$4.50			
ADEQ 401 Permit	100	pages	$0.15	$15.00			
ACOE 404 Permit	200	pages	$0.15	$30.00			
Control and Tenure of Land Documents	50	pages	$0.15	$7.50			
Pollution Prevention Plan	50	pages	$0.15	$7.50			
COF Grading Permit	5	SHEETS	$50.00	$250.00			
Binders	12	each	$5.00	$60.00			
Postage	12	mailings	$10.00	$120.00			
			SUBTOTAL	**$499.00**			
			TOTAL	**$16,799.00**	**$839.95**	**$17,639**	**5.7%**

Task 2. Prepare and Implement Site Assessment Plan
To provide strategy and outline steps needed to accomplish the project assessment and to conduct the site inventory for project area and concept plan area. Deliverables include 1) Site Assessment Plan, 2) Memo stating completion of Site Assessment

Direct Labor Costs	Estimated quantity		$/unit	Total Cost	5% Overhead	TOTAL TASK COST	% of Budget
NCD Civil Engineer	24	hrs	$95.00	$2,280.00			
NCD Riparian Ecologist	100	hrs	$75.00	$7,500.00			
NCD Engineering Technician	60	hrs	$75.00	$4,500.00			
NAU- Cottonwood Group Manager	40	hrs	$34.00	$1,360.00			
			SUBTOTAL	**$15,640.00**			
Direct Costs: Supplies, Printing, Postage, Travel, etc	Estimated quantity		$/unit	Total Cost			
Site Assessment Plan	100	pages	$0.15	$15.00			
Field Inventory Memo	20	pages	$0.15	$3.00			
Binders	6	each	$5.00	$30.00			
Postage	6	mailings	$10.00	$60.00			
			SUBTOTAL	**$108.00**			
			TOTAL	**$15,748.00**	**$787.40**	**$16,535**	**5.3%**

Task 3. Development of Final Design Plan
To describe stream channel restoration design, revegetation, weed management, and irrigatin activities to be used to enhance and restore the function of the stream channel and provide information necessary to obtain a Clean Water Act 404 permit.

Direct Labor Costs	Estimated quantity		$/unit	Total Cost	5% Overhead	TOTAL TASK COST	% of Budget
NCD Civil Engineer	40	hrs	$95.00	$3,800.00			
NCD Riparian Ecologist	60	hrs	$75.00	$4,500.00			
NCD Engineering Technician	50	hrs	$75.00	$3,750.00			
NAU Project Coordinator	100	hrs	$50.00	$5,000.00			
NAU- Cottonwood Group Manager	20	hrs	$34.00	$680.00			
			SUBTOTAL	**$17,730.00**			
Direct Costs: Supplies, Printing, Postage, Travel, etc	Estimated quantity		$/unit	Total Cost			
Final Design Report with Plans	600	pages	$0.15	$90.00			
Construction Drawings and Specifications	240	pages	$0.50	$120.00			
Final Cost Estimate	30	pages	$0.15	$4.50			
Binders	12	each	$5.00	$60.00			
Postage	12	mailings	$10.00	$120.00			
			SUBTOTAL	**$394.50**			
			TOTAL	**$18,124.50**	**$906.23**	**$19,031**	**6.2%**

Task 4. Develop Monitoring Plan

To provide strategy and outline steps needed to accomplish monitoring in a timely and efficient manner.

Direct Labor Costs	Estimated quantity		$/unit	Total Cost
NCD Civil Engineer	10	hrs	$95.00	$950.00
NCD Riparian Ecologist	30	hrs	$75.00	$2,250.00
NAU Project Coordinator	100	hrs	$50.00	$5,000.00
NAU- Cottonwood Group Manager	20	hrs	$34.00	$680.00
			SUBTOTAL	$8,880.00

Direct Costs: Supplies, Printing, Postage, Travel, etc	Estimated quantity		$/unit	Total Cost
Monitoring Plan	90	pages	$0.15	$13.50
Binders	6	each	$5.00	$30.00
Postage	6	mailings	$10.00	$60.00
			SUBTOTAL	$103.50
			TOTAL	$8,983.50

5% Overhead	TOTAL TASK COST	% of Budget
$449.18	$9,433	3.0%

Task 5. Develop Public Outreach and Education Plan

To provide strategy and outline steps needed to accomplish public outreach and educational goals.

Direct Labor Costs	Estimated quantity		$/unit	Total Cost
NCD Riparian Ecologist	20	hrs	$75.00	$1,500.00
Willow Bend Curriculum Development	120	hrs	$30.00	$3,600.00
EMA Adult Outreach Coordinator	100	hrs	$32.00	$3,200.00
NAU Project Coordinator	100	hrs	$50.00	$5,000.00
			SUBTOTAL	$13,300.00

Direct Costs: Supplies, Printing, Postage, Travel, etc	Estimated quantity		$/unit	Total Cost
EMA materials: office suplies etc.	1	l.s.	$100.00	$100.00
EMA Communications: Phone, Fax, Copies	1	l.s.	$150.00	$150.00
Public Outreach and Education Plan	90	pages	$0.15	$13.50
Binders	6	each	$5.00	$30.00
Postage	6	mailings	$10.00	$60.00
			SUBTOTAL	$353.50
			TOTAL	$13,653.50

5% Overhead	TOTAL TASK COST	% of Budget
$682.68	$14,336	4.6%

Task 6. Initial Construction, Weed Management, and Re-vegetation Effort

To implement the project design and document the construction process.

Direct Labor Costs	Estimated quantity		$/unit	Total Cost
NCD Civil Engineer	20	hrs	$95.00	$1,900.00
NCD Riparian Ecologist	80	hrs	$75.00	$6,000.00
NCD Engineering Technician	40	hrs	$75.00	$3,000.00
NAU- Cottonwood Group Manager	20	hrs	$34.00	$680.00
NAU Project Coordinator	100	hrs	$50.00	$5,000.00
Archeologist	40	hrs	$85.00	$3,400.00
			SUBTOTAL	$19,980.00

Captital Outlay & Equipment Costs	Estimated quantity		$/unit	Total Cost
Mobilization/Demobilization:				
Mini-Excavator with Auger	1	l.s	$500.00	$500.00
Excavator	1	l.s	$500.00	$500.00
Dump Truck	1	l.s.	$500.00	$500.00
Earthwork-Structures:				
Channel Smoothing - Bank Sloping	3,000	ft	$8.00	$24,000.00
Weed Management				
Herbicide (backpack)	5	acres	$250.00	$1,250.00
Mechanical Treatment (hand pulling)	5	acres	$100.00	$500.00
Water Management				
Drip Irrigation System	5	acres	$1,000.00	$5,000.00
Revegetation				
Erosion Control Fabric	15	ea	$70.00	$1,050.00
Wood Stakes	400	ea	$1.75	$700.00
Staples (1000/box)	2	boxes	$40.00	$80.00
Wild-harvested Willows	1,500	ea	$5.50	$8,250.00
Propagated willows	150	ea	$15.00	$2,250.00
Propagated Cottonwoods	260	ea	$15.00	$3,900.00
Container Shrubs	150	ea	$40.00	$6,000.00
Sand or Cinders for Soil Amendment	50	cy	$5.00	$250.00
Tree guards	700	ea	$2.00	$1,400.00
Seed	5	acres	$350.00	$1,750.00
			SUBTOTAL	$57,880.00

Direct Costs: Supplies, Printing, Postage, Travel, etc	Estimated quantity		$/unit	Total Cost
Initial Construction Report	100	pages	$0.15	$15.00
Binders	6	each	$5.00	$30.00
Postage	6	mailings	$15.00	$90.00
			SUBTOTAL	$135.00
			TOTAL	$77,995.00

5% Overhead	TOTAL TASK COST	% of Budget
$3,899.75	$81,895	26.5%

Task 7. Additional Construction, Weed Management, and Re-vegetation Efforts

To evaluate the success of the initial construction effort, to prepare a detailed design plan for additional construction activities and implement practices to meet project objectives.

Direct Labor Costs	Estimated quantity		$/unit	Total Cost
NCD Civil Engineer	10	hrs	$95.00	$950.00
NCD Riparian Ecologist	40	hrs	$75.00	$3,000.00
NCD Engineering Technician	20	hrs	$75.00	$1,500.00
NAU Project Coordinator	100	hrs	$50.00	$5,000.00
NAU- Cottonwood Group Manager	20	hrs	$34.00	$680.00
			SUBTOTAL	**$11,130.00**

Captital Outlay & Equipment Costs	Estimated quantity		$/unit	Total Cost
Mobilization/Demobilization:				
Mini-Excavator with Auger	1	l.s	$500.00	$500.00
Weed Management				
Herbicide (backpack)	5	acres	$250.00	$1,250.00
Mechanical Treatment (hand pulling)	5	acres	$50.00	$250.00
Revegetation				
Wild-harvested Willows	500	ea	$5.50	$2,750.00
Propagated willows	100	ea	$15.00	$1,500.00
Propagated Cottonwoods	300	ea	$15.00	$4,500.00
Container Shrubs	50	ea	$40.00	$2,000.00
Sand or Cinders for Soil Amendment	20	cy	$5.00	$100.00
Tree guards	300	ea	$2.00	$600.00
Seed	5	acres	$350.00	$1,750.00
			SUBTOTAL	**$15,200.00**

Direct Costs: Supplies, Printing, Postage, Travel, etc	Estimated quantity		$/unit	Total Cost
Initial Construction Report	100	pages	$0.15	$15.00
Binders	6	each	$5.00	$30.00
Postage	6	mailings	$15.00	$90.00
			SUBTOTAL	**$135.00**

		5% Overhead	TOTAL TASK COST	% of Budget
TOTAL	**$26,465.00**	**$1,323.25**	**$27,788**	**9.0%**

Task 8. Conduct Monitoring

To monitor the success of the restoration efforts and their effectiveness at meeting AWPF and project goals. This task includes monitoring the project annually: baseline, year 1, year 2, year 3, and year 4. Cottonwood Ecology group will monitor trees monthly.

Direct Labor Costs	Estimated quantity		$/unit	Total Cost
NCD Civil Engineer	50	hrs	$95.00	$4,750.00
NCD Riparian Ecologist	130	hrs	$75.00	$9,750.00
NCD Engineering Technician	100	hrs	$75.00	$7,500.00
NAU Project Coordinator	250	hrs	$50.00	$12,500.00
NAU- Cottonwood Group Manager	264	hrs	$34.00	$8,976.00
			SUBTOTAL	**$43,476.00**

Captital Outlay & Equipment Costs	Estimated quantity		$/unit	Total Cost
Stream gage	1	ls	$3,000.00	$3,000.00
			SUBTOTAL	**$3,000.00**

Direct Costs: Supplies, Printing, Postage, Travel, etc	Estimated quantity		$/unit	Total Cost
Baseline Monitoring Report	360	pages	$0.15	$54.00
Year 1 Annual Monitoring Report	360	pages	$0.15	$54.00
Year 2 Annual Monitoring Report	360	pages	$0.15	$54.00
Year 3 Annual Monitoring Report	360	pages	$0.15	$54.00
Binders	24	each	$5.00	$120.00
Postage	24	mailings	$10.00	$240.00
			SUBTOTAL	**$576.00**

		5% Overhead	TOTAL TASK COST	% of Budget
TOTAL	**$47,052.00**	**$2,352.60**	**$49,405**	**16.0%**

Task 9. Public Outreach and Education Implementation

To educate the public about the impacts of human activity of watersheds, riparian corridor restoration, provide a place for visitors to enjoy recreating in the outdoors, to highlight AWPF funding opportunities, and to evaluate the success of public outreach efforts associated with the project.

Direct Labor Costs	Estimated quantity		$/unit	Total Cost
NCD Civil Engineer	20	hrs	$95.00	$1,900.00
NCD Riparian Ecologist	30	hrs	$75.00	$2,250.00
NAU Project Coordinator	50	hrs	$50.00	$2,500.00
EMA Adult Outreach Coordinator	350	hrs	$32.00	$11,200.00
Specialists for EMA Outreach Events	5	events	$200.00	$1,000.00
EMA Web Master	1	l.s. fee	$1,000.00	$1,000.00
Willow Bend Educator(s)	130	hrs	$30.00	$3,900.00
			SUBTOTAL	**$23,750.00**

Direct Costs: Supplies, Printing, Postage, Travel, etc	Estimated quantity		$/unit	Total Cost
Workshop Handouts	2,000	pages	$0.15	$300.00
Willow Bend Class Materials	120	classes	$75.00	$9,000.00
Willow Bend Field Trip Materials	20	field trips	$125.00	$2,500.00
Willow Bend Education Community Events	4	events	$500.00	$2,000.00
EMA Facilities for Events (x 5 events)	5	events	$500.00	$2,500.00
etc)	1	l.s.	$500.00	$500.00
Interpretive Signage	6	ea	$1,000	$6,000.00
Public Outreach/Education Report (one each year for 3 years)	300	pages	$0.15	$45.00
Binders	24	ea	$5.00	$120.00
Postage	24	ea	$10.00	$240.00
			SUBTOTAL	**$23,205.00**

		5% Overhead	TOTAL TASK COST	% of Budget
TOTAL	**$46,955.00**	**$2,347.75**	**$49,303**	**15.9%**

Task 10. Concept Plan for Future Phase II

To provide a detailed concept plan that outlines possible enhancements for the downstream segment of Sinclair Wash on City of Flagstaff property using site assessment information and lessons learned from upstream implementation.

Direct Labor Costs	Estimated quantity		$/unit	Total Cost
NCD Civil Engineer	40	hrs	$95.00	$3,800.00
NCD Riparian Ecologist	60	hrs	$75.00	$4,500.00
NAU Project Coordinator	50	hrs	$50.00	$2,500.00
NAU- Cottonwood Group Manager	20	hrs	$34.00	$680.00
			SUBTOTAL	**$11,480.00**

Direct Costs: Supplies, Printing, Postage, Travel, etc	Estimated quantity		$/unit	Total Cost
Concept Plan	180	pages	$0.15	$27.00
Concept Plan	6	CDs	$2.00	$12.00
Binders	6	each	$5.00	$30.00
Postage	6	mailings	$10.00	$60.00
			SUBTOTAL	**$129.00**

		5% Overhead	TOTAL TASK COST	% of Budget
TOTAL	**$11,609.00**	**$580.45**	**$12,189**	**3.9%**

Task 11. Final Report

To provide a comprehensive final report for public distribution that gives a detailed description of the project and showcases its benefits to the state of Arizona, City of Flagstaff and Northern Arizona University.

Direct Labor Costs	Estimated quantity		$/unit	Total Cost
NCD Civil Engineer	20	hrs	$95.00	$1,900.00
NCD Riparian Ecologist	80	hrs	$75.00	$6,000.00
NAU Project Coordinator	50	hrs	$50.00	$2,500.00
NAU- Cottonwood Group Manager	20	hrs	$34.00	$680.00
			SUBTOTAL	**$11,080.00**

Direct Costs: Supplies, Printing, Postage, Travel, etc	Estimated quantity		$/unit	Total Cost
Final Project Report	600	pages	$0.15	$90.00
Final Project Report	6	CDs	$2.00	$12.00
Binders	6	each	$5.00	$30.00
Postage	6	mailings	$10.00	$60.00
			SUBTOTAL	**$192.00**

		5% Overhead	TOTAL TASK COST	% of Budget
TOTAL	**$11,272.00**	**$563.60**	**$11,836**	**3.8%**

TOTAL PROJECT BUDGET	**$283,047.50**	**$14,152.38**	**$309,390**

Matching Funds

Detailed In-Kind Contributions

Sinclair Wash Enhancement Project

TASK		UNIT COST	# OF UNITS	UNIT	TOTAL COST	TOTAL PER TASK
1	**Permits, Authorizations, Agreements**					
	Arizona Game and Fish Department (AGFD)	$20	20	hours	$400	
						$400.00
2	**Prepare and Implement Site Assessment Plan**					
						$0.00
3	**Development of Final Design, Weed Management, and Revegetation Plan**					
	AGFD	$20	5	hours	$100	
	Dr. Tom Whitham- NAU Cottonwood	$50	120	hours	$6,000	
						$6,100.00
4	**Develop Monitoring Plan**					
	Karla Kennedy-Garden Manager-Cottonwood Group	$34	20	hrs	$680	
						$680.00
5	**Develop Public Outreach and Education Plan**					
	Willow Bend Education Development	$30	80	hrs	$2,400	
						$2,400.00

Matching Funds Cont...

6 Initial Construction, Weed Management, and Re-

NAU Chapter- The Wildlife Society	$15	100	hours	$1,500	
Whitham Cottonwood Group	$20	40	hours	$800	
Karla Kennedy- Garden Manager- Whitham Cottonwood Group	$34	20	hours	$680	
NAU Irrigation Crew(4 people)	$80	160	hours	$12,800	
AGFD	$20	16	hours	$320	
					$16,100.00

7 Additional Construction, Weed Management,and Re-

					$0.00

8 Conduct Monitoring

AGFD	$20	5	hours	$100	
NAU, Dr. Nancy Johnson, ENV 230 students x 5 years	$10	60	hours	$600	
Karla Kennedy- Garden Manager- Whitham Cottonwood Group	$34	1000	hours	$34,000	
Jaime Lamit- IGERT Fellow Internship- Monitoring	$15	240	hours	$3,600	
					$38,300.00

9 Public Outreach and Education Implementation

AGFD	$20	5	hours	$100	
Whitham Cottonwood Group Signage Input	$20	5	hours	$100	
Dr. Tom Whitham- Field Ecology Course BIO 573	$50	120	hours	$6,000	
Willow Bend Education Implementation- Chris Newell	$30	80	hours	$2,400	
					$8,600.00

10 Concept Plan for Future Phase II

					$0.00

11 Final Project Report

Karla Kennedy- Garden Manager- Whitham Cottonwood Group	$34	20	hours	$680	
Willow Bend Education Final Report- Sapna Sopori	$30	20	hours	$600	
					$1,280.00

TOTAL PROJECT BUDGET $73,860.00

APPENDIX

Supplemental Information

Supplemental Information

State Historic Preservation Office Review Form

Key Personnel

Project Site Photographs

Plans- Monitoring, Re-vegetation

Existing Plans/Reports

Community Support

Evidence of Control and Tenure of Land

Evidence of Physical and Legal Availability of Water

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: AZ Water Protection Fund

2. Project Title: Sinclair Wash Riparian Enhancement Project

3. Applicant Name and Address: Northern Arizona University, Dept of Biological Sciences, PO Box 5640 , Flagstaff, AZ 86011

4. Current Land Owner/Manager(s): Northern Arizona University

5. Project Location, including Township, Range, Section: T21N, R7E, S21

6. Total Project Area in Acres (or total miles if trail): 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 project will repair a failing trail crossing, shape the stream channel, and plant many riparian plants the entire distance of

the project area. Subsurface impacts include excavating soil from some banks and digging holes to plant vegetation.

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: The area has been extensively disturbed to allow surrounding development. It has been graded in the past.

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

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: Near Historic Downtown Flagstaff

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

Wilma G. Ennenga / 11 June 2008 Wilma G. Ennenga

Applicant Signature /Date Applicant Printed Name

FOR SHPO USE ONLY
SHPO Finding: ☐ Funding this project will not affect historic properties. ☐ Survey necessary – further GRANTS/SHPO consultation required (*grant funds will not be released until consultation has been completed*) ☐ Cultural resources present – further GRANTS/SHPO consultation required (*grant funds will not be released until consultation has been completed*)
SHPO Comments
For State Historic Preservation Office: Date:

Key Personnel

Project Coordinator/Manager

Dr. Tom Whitham will serve as project contact and coordinator. All contract correspondence should be directed to Dr. Whitham. Dr. Whitham and NAU will submit all billing requests. Biographic sketch below.

Project Technical Manager

Tom Moody, P.E. will serve as project technical manager. He will serve as the principal contact for all technical issues regarding the project. All correspondence regarding project deliverables, tasks, and other technical questions should be directed to Mr. Moody with copies sent to the Project Coordinator. Project deliverables will be transmitted to the AWPF Project Manager directly by Mr. Moody after review and approval by the Project Coordinator. Biographic sketch below.

Project Partners

Dr. Thomas Whitham- Cottonwood Ecology Group- NAU

Tom Whitham is a Regents' Professor of Biology and the Executive Director of the Merriam-Powell Center for Environmental Research at Northern Arizona University. He has studied the ecology, community, and restoration of riparian communities for many years. Recent restoration efforts include the planting of 30,000 trees at sites in Utah, Arizona and California. One of these sites is at the Cibola National Wildlife Refuge and another is a former Super-Fund Site. His oldest restoration site was planted in 1982 and the trees at this site have grown into a 60' tall gallery forest. His degree in nursery management and restoration experience provide him with a wealth of knowledge to conduct this project. Of his 160 publications, many have appeared in journals such as Conservation Biology, Ecology, Ecological Applications, and Wetlands. His diverse collaborations combining restoration, experimental forests, climate change, and education have demonstrated how multidimensional projects can leverage limited funds and serve many goals. He has testified before congressional hearings on the Endangered Species Act and on national policies regarding the use of genetically modified organisms. His research group is internationally recognized and has been singled out for the past two consecutive years for special recognition by the Office of Emerging Frontiers of the National Science Foundation.

Dr. Nancy Johnson- Environmental Sciences- NAU

Dr. Nancy Johnson will lead her undergraduate classes in monitoring channel morphology and other data collection techniques with Dr. Diana Anderson in their ENV 230 class that focuses on XX. Dr. Johnson received her B.S. in Biology at the University of Minnesota, a M.S. in Botany at the University of Wisconsin, Madison, and then returned to the U of M and received her Ph.D in Ecology/Plant Pathology in 1991. Dr. Johnson taught biology at the University of New Mexico from 1993 to 1996, while completing a National Science Foundation Fellowship. She then moved to Flagstaff, Arizona where she has advised masters and doctoral students and taught classes in biology and environmental science for 11years.

Chris Newell- Willow Bend Environmental Education Center

Christine L. Newell has been the Director of Willow Bend since 2004. She has a M.S. in Ecology and a secondary teaching certificate in English and science. Her responsibilities at Willow Bend include program direction and oversight, development, and project management. Her 20 years of professional experience are marked by innovative approaches to addressing environmental issues and include working for a multi-state environmental granting foundation, a regional not-for-profit environmental advocacy organization, a gas and electric utility company, and an international environmental consulting company. Her experience includes curriculum development, educational program review and editing, grant writing, project management, environmental improvement project design, and teaching.

Sapna Sopori- Willow Bend Environmental Education Center

Sapna Sopori is Willow Bend's Education Program Manager. Her responsibilities include curriculum development and implementation, education program coordination, and volunteer management. She has been with Willow Bend since 2004. She has a B.S. in Ecology and Evolution and a M.A. in Environmental Education, and eight years experience teaching in nature centers. Her background includes curriculum

development, teaching in the classroom and outdoors, special event coordination and implementation, volunteer management, and pubic relations.

Sarah Lantz- AZ Game and Fish Department

As the Urban Wildlife Planner, Sarah serves as the cooperative planning liaison between the Arizona Game and Fish Department and Coconino County. In this role, Sarah works on urban open space conservation/restoration projects that protect wildlife habitat connectivity, reduce the potential for negative human-wildlife interactions, and enhance wildlife watching opportunities for people in urban and rural communities in Coconino County. Sarah has a research background specific to understanding wildlife-habitat relationships and migratory bird ecology. On this project, she will provide her expertise on project design that provides the greatest benefit to wildlife without creating unsafe nuisance wildlife situations.

Technical Subcontractors

Natural Channel Design, Inc. (NCD) will be subcontracted to provide technical assistance with this project. NCD is a consulting engineering firm specializing in education, research, assessment, and restoration design of natural stream channels in the arid southwest. NCD has extensive experience in stabilization and enhancement of natural stream channels in the arid southwest and has applied that expertise to design and permitting of projects for federal and state agencies, tribal entities, municipalities, and private developers. NCD has professional engineering licenses in Arizona and Utah.

NCD combines the geomorphic approach to channel assessment and design with traditional engineering methods. The geomorphic or natural channel approach is based on 40 years of empirical work by Luna Leopold and others and includes the stream classification and assessment techniques developed by David Rosgen. The approach seeks to assess and restore stream channels by moving them toward their potential stable form. Bioengineering practices utilizing native plant and structural materials are extensively incorporated in restoration design.

Key Technical Personnel

Tom Moody, P.E. Civil Engineer. Mr. Moody will serve as project engineer and technical manager with overall responsibility for review and submittal of all technical project deliverables.

Stephanie Yard, P.E. Civil Engineer. Ms. Yard will as assistant project engineer. She will oversee fieldwork, data assessment, and project design.

Mark Wirtanen, Riparian Ecologist/Engineering Technician. Mr. Wirtanen will serve as assistant to the project engineers. He will assist with field coordination and project design.

Elizabeth J Ruther, Riparian Ecologist. Ms. Ruther will serve as field coordinator and provide assistance in the data collection, report generation, assessment and design tasks.

Allen Haden, Aquatic Ecologist. Mr Haden will assist in data collection, project implementation, survey, and design.

Kendra Kordes, GIS Technician/Riparian Ecologist. Ms. Kordes will assist in data collection, plan and report writing, map creation, and fieldwork.

Tom Moody, P.E. is a licensed civil engineer and principal in Natural Channel Design, Inc. Tom has performed stream assessments and restoration designs for perennial and ephemeral channels in Nevada, Arizona, Utah, and New Mexico. He has experience in the assessment and design of stream projects for erosion control, riparian enhancement, and channel stability. He has conducted research on stream systems and watershed science in the regions of Arizona and New Mexico including the Navajo Nation. He served as principal investigator on projects to validate the Bank Erodibility Hazard Index, a bank erosion rate model, in New Mexico and the Navajo Nation. He has conducted workshops on the geomorphic approach to natural channel morphology and Bio-engineering for the Natural Resources Conservation Service, USDA Forest Service, AZ Dept. of Environmental Quality, Arizona Water Protection Fund and other agencies.

Technical Education and Training: Mr. Moody has a degree in Civil Engineering with an environmental emphasis from Northern Arizona University and has completed the Level I – IV workshops in the inventory, classification, assessment, and design of natural channels from David Rosgen at Wildland Hydrology. Mr. Moody is a member of the Arizona Riparian Council, Arizona Hydrological Society, American Society of Civil Engineers, and Arizona Floodplain Managers Association. Mr. Moody is a licensed Civil Engineer in the State of Arizona (#34005) and a licensed Professional Engineer in the State of Utah (#4977296).

Stephanie Yard, P.E. is a licensed civil engineer and principal in Natural Channel Design, Inc. She served 12 years as a civil engineer with the Natural Resources Conservation Service practicing natural resource engineering across northern Arizona. She completed a variety of inventories and assessments on riparian systems throughout Arizona and had statewide responsibility for riparian restoration practices. She designed and supervised construction on numerous NRCS-Emergency Watershed Protection projects for stream stabilization. She has extensive experience in design and installation of traditional engineering approaches to streambank protection (rock riprap, gabions, jacks, rock masonry) and grade stabilization. She provided leadership for projects involving tribal lands, state and federal agencies, and private landowners. She has conducted a variety of training workshops on the natural channel approach to stream assessment and restoration.

Technical Education and Training: Ms. Yard has a degree in Civil Engineering from Northern Arizona University and has completed the Level I – IV workshops in the inventory, classification, assessment, and design of natural channels from David Rosgen at Wildland Hydrology. She has received formal NRCS training in wetland restoration, bioengineering, and natural resource planning and application. Ms. Yard is a licensed Civil Engineer in the State of Arizona (#26889).

Mark Wirtanen serves as a field manager of Natural Channel Design, Inc. for riparian and geomorphic studies of the rivers of the arid southwest. He has performed stream assessments and assisted in restoration designs for channels in Arizona, New Mexico and Utah. He has a degree in wildlife biology and a broad knowledge of field methods as well as digital terrain software and CAD systems. Over the past four years he has conducted basic research into natural channels of Arizona, New Mexico, and the Navajo Nation and co-authored a report on regional relationships of bankfull stage on stream channels in New Mexico and the Navajo Nation. He has conducted training workshops utilizing the geomorphic approach to natural channel morphology and assessment.

Technical Education and training: Mr. Wirtanen has a degree in Wildlife Biology from Northern Arizona University and has completed the Level I – III workshops in the inventory, classification, and assessment of natural channels from David Rosgen at Wildland Hydrology.

Elizabeth J. Ruther is a biologist and project associate for Natural Channel Design, Inc. For several years she has been involved in arid ecosystems and human interactions. Her geographical area of expertise includes the Coconino Plateau above the Mogollon Rim. Her interests also include riparian ecosystems policy of the southwest.

Technical Education and Training: Ms. Ruther received a B.S. in Biology and B.A. in Environmental Studies from University of Minnesota-Duluth. Her passion for understanding interdisciplinary environmental issues led her to Northern Arizona University where she studied the human dimensions of wildlife management and completed her M.S. in Environmental Science and Policy in May 2005.

Allen Haden is an aquatic ecologist and project associate for Natural Channel Design. He has been involved in research and management of human impacts on river ecosystems in the southwest for over 15 years. His major interest is the interaction of habitat changes and nonnative species on native aquatic insects and fish. He has a broad understanding of the field of aquatic ecology and its applications to management of ecosystems which house threatened and endangered species. He has expertise in sampling and statistical techniques for monitoring biological and physical aspects of riparian/aquatic habitats, as well as an understanding of life history requirements and threats to southwestern native species. He has direct experience with restoration of physical and biotic components of southwestern streams stemming from long-term involvement in restoration of Fossil Creek, Arizona.

Technical Education and Training: Mr. Haden has an M. S. in aquatic ecology from Northern Arizona University (1997). He earned his B. S. degree from Virginia Tech in 1988. He is a member of the North American Benthological Society and Sigma Xi Research Society. He has authored published and pending manuscripts on the effects of both physical and biotic stressors to aquatic ecosystems in the southwest.

Kendra Kordes is a forester and project associate for Natural Channel Design, Inc. For several years she has been studying ponderosa pine ecosystems and their associated riparian habitats. Her interests include watershed function, fire ecology, and ecosystem restoration and health.

Technical Education and Training

Ms. Kordes received a B.S. in Forestry from Northern Arizona University in the spring of 2007. She has completed courses in Watershed Restoration and Ecological Restoration. She is a member of the Society of American Foresters (SAF), the Association for Fire Ecology (AFE), and Xi Sigma Pi National Forestry Honors Society.

Project Site Photographs

Figure 1. Cottonwood Ecology Group planting relict cottonwood research garden.

Figure 2. New gardens irrigation system, similar to what would be installed on Sinclair Wash.

Figure 3. Same cottonwood garden 13 years later.

Figure 4. Trail Crossing (looking upstream) during monsoon flood in summer 2006.

Figure 5. Steep hillside owned by NAU that is adjacent to stream channel. Vegetation will be planted to decrease sediment and storm water inputs.

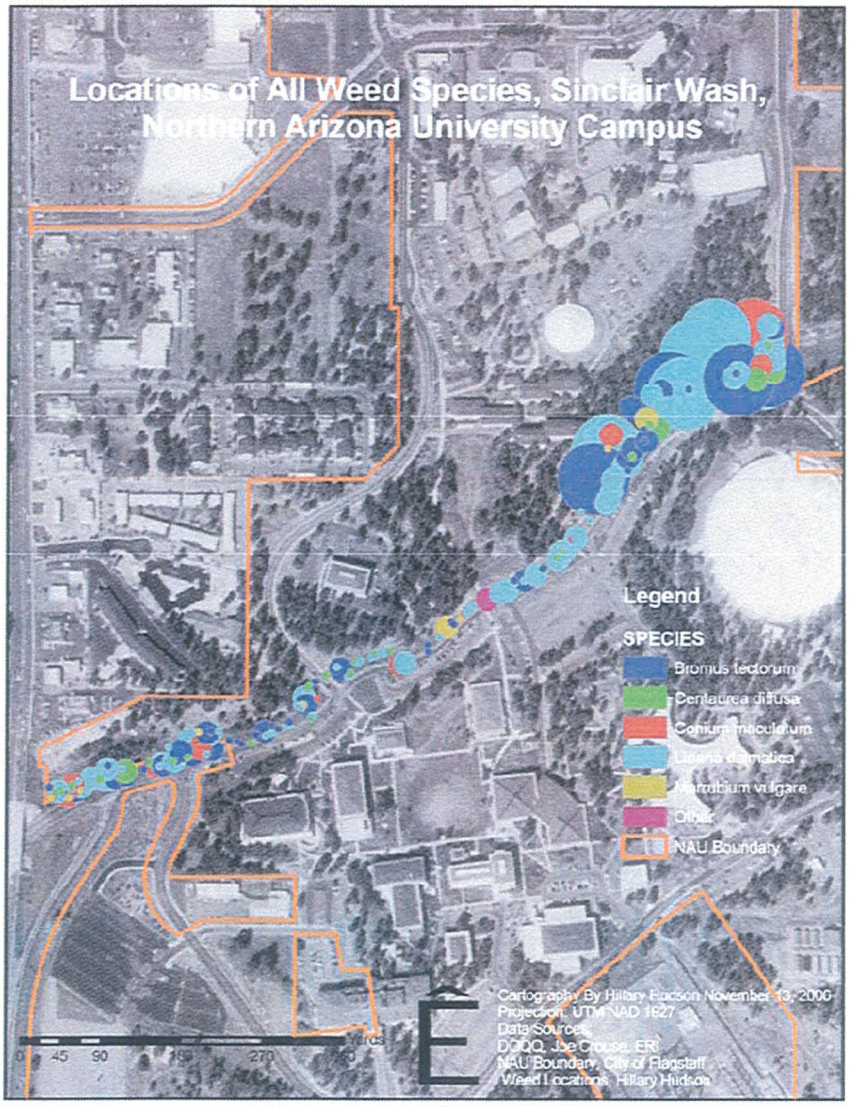


Figure 6. Weed species at Sinclair Wash and their location. Size of circles relate to size of weed patch.

Figure 7. Representative photo of project area on NAU property.

Figure 8. One cottonwood in the center of the channel in the project area.

Figure 9. Reference site located just downstream of project area.

Figure 10. Reference site located on Rio De Flag in West Flagstaff.

Plans- Monitoring, Re-vegetation

Introduction

It is imperative that we maintain functional and diverse riparian corridors in order to inhibit erosion, improve water quality, provide habitat to wetland and migratory species, and protect property values. Sinclair Wash is an ephemeral stream that flows through an urban area with high visibility to the community, and its improved condition will provide a showcase with increased educational and recreational opportunities for the people of Flagstaff. Sinclair wash could support a more diverse plant community with the potential to harbor species that have been negatively impacted in other parts of the Flagstaff watershed. In order to enhance this resource, three failing trail crossings that are driving lateral and vertical erosion must be re-designed and surrounding banks need to be stabilized. Vegetation must be added to increase stream function and enhance the wash for wildlife.

Assessment and Design

A "natural channel" approach will be used in project assessment and design. This empirical approach inventories the existing condition of physical and biological components of the stream system and assesses them against a "reference condition". The reference condition will be based on surveys of reaches of Billy Creek that are unimpaired or functioning. Reference reaches exist within or very near to the project site. Stream channel stability will be one evaluation criteria for the physical system. Stability is defined as a stream's ability to carry the water and sediment of its watershed while maintaining dimension, pattern, and profile without aggrading or degrading over time.

A variety of surveys will be used to characterize the physical and biological components of the system. Longitudinal profiles and cross-section surveys will be used to characterize the physical stream morphology. These surveys will produce information on channel width, slope, channel shape (width-depth ratio), floodplain access (entrenchment ratio), pool and riffle depths, meander patterns (meander width/length and radius of curvature), and Bank Erodibility Hazard Index (BEHI). Pebble counts will be conducted to evaluate the channel bed substrate. The composition and density of riparian vegetation will be qualitatively described in both existing and reference conditions. The data collected and used for assessment will also be used as baseline conditions during the post-construction monitoring.

The final design will be driven by the objectives of removing impairments to natural stream function, enhancing native riparian vegetation and habitats, increasing educational value, and increasing public awareness and support of Sinclair Wash. The design will be based on quantitative geomorphologic, hydrologic, and vegetative data. Design components may include channel shaping, floodplain lowering or widening, and trail crossing design to work with the stream shape rather than against it. All structural components will use natural materials and be designed for minimum alterations to natural stream processes. All natural channel design projects include the extensive use of bioengineering practices using native plants to strengthen stream banks and enhance riparian plant communities. The practices are expected to be similar to those successfully used on other AWPF projects.
The final design will include the following components at a minimum:

1. Narrative summarizing assessment activities
2. Summary of inventory and evaluation conclusions
3. Design report
4. Final design drawings, including design parameters,
5. Construction specifications
6. Revegetation plan
7. Engineers cost estimate

The Project Assessment and Final Design Report will be reviewed and signed/stamped by a Professional Engineer licensed in the State of Arizona.

Permitting

Regulatory permitting is an essential task of every riparian restoration project. Cultural resource surveys will be conducted along all areas planned for disturbance for SHPO approval. An evaluation of the impacts to biological resources will be prepared for submittal to the Army Corps of Engineers under Section 404 of the Clean Water Act.

Construction

Heavy equipment will be used for re-vegetating the project area, installing new crossings, and channel shaping. Every effort will be made to minimize the impacts of machinery during construction to the stream channel. Bioengineering practices are generally installed manually however a mini-excavator will be used to dig the holes for the plantings. Local willow and relict Mogollon Rim cottonwood species will be harvested and used to stabilize banks. There are abundant local sources for plant materials. Effective pollution control and safety measures will be implemented during construction. All construction activities will be supervised by the design engineer or designated representative.

Monitoring

A monitoring plan will be prepared that incorporates measurements of key components of the project to evaluate the relative success in meeting project objectives. The following components will be included in the monitoring plan:

- Stream stability: A set of permanent cross-sections will be monitored to evaluate vertical and lateral instability (Figure 19).
- Vegetation: Transects will be established to quantitatively monitor vegetation survival and ground cover.
- Change over time: A set of permanent photo points will be used to qualitatively record changes in vegetation and channel condition (Figure 19).

All monitoring protocols will be described along with equipment needs, sampling schedule, expected results, and monitoring frequency.

Revegetation/Restoration Plans

A revegetation plan will be completed that describes the bioengineering practices to be installed in the project. The Grantee will perform all revegetation activities as described in the approved Project Assessment and Design Report. Revegetation is expected to be completed in the late fall to minimize disturbance to aquatic species and during the beginning of the dormant period for riparian vegetation. Specific areas for revegetation will be identified along with the species and application rates for all plantings. All disturbed areas within the project will be reseeded using native grasses.

Each fall, the Grantee will assess the success of revegetation efforts to plan subsequent treatments as needed. In this way, the Grantee will be able to manage in an adaptive manner to account for unforeseen damage from high flows, drought, or frost, failure or some revegetated areas, or the need for additional structures or bioengineering. The Grantee will submit an Initial Revegetation Report to the AWPF Program Manager after Year 1 revegetation tasks are completed, and a Subsequent Revegetation Report after Year 2 revegetation tasks are complete. Additional Revegetation Reports will be submitted at the end of any year that follow-up revegetation or bioengineering are needed.

Existing Plans/Reports

A Survey of Exotic Invasive Plant Species for Sinclair Wash, Northern Arizona University, Flagstaff, AZ

Linaria dalmatica
Photo Credit: G.A. Cooper @ USDA-NRCS PLANTS Database

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Community Support

Letters from the community in support of this project are attached.

There are letters from the following organizations:

The City of Flagstaff
NAU- Capital Assets and Services
The Cottonwood Ecology Group at NAU
The Audubon Society
Arizona Game and Fish Department
The Student Chapter of the Wildlife Society
The Center for Environmental Science and Education (CESE)
Dr. Paul Beier
Ecological Monitoring and Assessment Program
Willow Bend Environmental Education Center
The Arboretum at Flagstaff

NORTHERN ARIZONA UNIVERSITY

Capital Assets and Services
P.O. Box 6016
Flagstaff, Arizona 86011-6016

Arizona Water Protection Fund Commission
Arizona Department of Water Resources
3550 N. Central Ave.
Phoenix, Arizona 85012

June 10, 2008

Re: Sinclair Wash Enhancement Project

Dear Arizona Water Protection Fund Commissioners:

As utilities director at Capital Assets and Services Department at Northern Arizona University, I would like to express my support for the Sinclair Wash Enhancement Project located in Flagstaff, Arizona on our campus. We appreciate the opportunity the project provides to enhance riparian corridor function and wildlife habitat in this urban environment. Northern Arizona University is interested collaborating with the many project partners that have come together to make this project a reality.

NAU understands that the purpose of the project is to enhance native plant communities and improve the stream function of the wash. This project will also provide many benefits to the university community and provide educational opportunities within walking distance from the classroom. After the wash is re-vegetated with native species, Sinclair Wash will act as a wildlife corridor and provide many opportunities for the community to enjoy riparian green space within city limits. NAU is committed to supplying irrigation water using reclaimed water sources for the duration of the grant project. It is our understanding that the water used for this project aims to be temporary, however in event of drought or other unfavorable weather, the irrigation system will remain intact to supply water if necessary.

Capital Assets and Services at NAU recognizes the investment in this project requested of the AWPF and is enthusiastic about the opportunity to provide support and assistance for enhancing Sinclair Wash. Our department has agreed to install the irrigation system with the NAU irrigation crew as a form of participation to this worthwhile project. We agree to work closely with the grantee and technical support as well as other stakeholders to see this project to completion and to help with its success into the future.

If you have any questions or concerns, please do not hesitate to contact me.

Respectfully,

Mark Flynn
Director of Utilities

City of Flagstaff

Arizona Water Protection Fund Commission
Arizona Department of Water Resources
3550 N. Central Ave.
Phoenix, Arizona 85012-2105

June 6, 2008

Re: Sinclair Wash Enhancement Project

Dear Commissioners:

The City of Flagstaff (COF) would like to express its support for the Sinclair Wash Enhancement Project. Open space, recreation, education opportunities, and wildlife habitat within the urban interface is of critical concern to the COF. We feel this project will help meet these long-term objectives and urge that the Commission fund this grant proposal.

We understand the importance of community partnerships and support Northern Arizona University in their endeavor. In the future, we would welcome working towards a larger collaborative effort for a potential Phase II enhancement of the Wash which is located on City property and lies directly downstream from the proposed project area.

The Stream Team, a collaborative effort with other organizations, agencies, and community members, coordinated through the City of Flagstaff, Stormwater Department, has identified Sinclair Wash as a priority stream reach for enhancement/restoration. We also look upon this project as a great opportunity to lesson impacts from stormwater run-off.

Thank you for the opportunity to express our support for this project.

Sincerely,

Kevin Burke
City Manager

Cc: Stacey Brechler-Knaggs, Grants Manager

Arizona Relay Service 7-1-1
211 West Aspen Avenue, Flagstaff, Arizona 86001
Main & TDD (928) 774-5281 • Fax (928) 779-7696

NORTHERN ARIZONA
UNIVERSITY
College of Engineering & Natural Sciences

Department of Biological Sciences
Northern Arizona University
PO Box 5640
Flagstaff, AZ 86011-5640
928-523-2381
928-523-7500 fax
http://www3.nau.edu/biology

May 20, 2008

Arizona Water Protection Fund Commission
Arizona Department of Water Resources
3550 N. Central Ave.
Phoenix, Arizona 85012

Re: Sinclair Wash Enhancement Project

Dear Arizona Water Protection Fund Commissioners:

The Merriam-Powell Center for Environmental Research and the Cottonwood Ecology Group at Northern Arizona strongly supports the proposed project for the Sinclair Wash Enhancement Project. As a stakeholder, we appreciate the opportunity the project provides to enhance riparian corridor function and wildlife habitat in this urban environment.

We understand that the purpose of the project is to enhance native plant communities and improve the stream function of the wash. This project will also provide many benefits to the university community and provide educational opportunities within walking distance from the classroom. After the wash is re-vegetated with native species, Sinclair Wash will act as a wildlife corridor and provide many opportunities for the community to enjoy riparian green space within city limits.

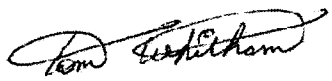
In addition to the above objectives, our group is interested in using relict narrowleaf cottonwood and willow that we are propagating from isolated pockets throughout the rim county. These relict stands (often as few as 5 trees, all from the same clone) are often found at the edge of a natural spring. These trees and shrubs are the last-of-the-last that have survived the drying out of the West since the retreat of the glaciers 10,000 years ago. Now that many are down to one tree with a few progeny that have sprouted from the roots to form a small clone all of the same sex (sexes are separate in these trees), they can no longer sexually reproduce because potential mates are too far away. With predicted climate change and ongoing droughts, many of these relicts have a high probability of going extinct. Because our studies show that these trees support a diverse community of microbes to vertebrates numbering about 1000 species, many of which are not found on surrounding vegetation, their loss would affect a much larger community. Thus, there is great conservation and education value in protecting these relicts as they are the last-of-the-last. By having them planted on University grounds under the protection of many watchful eyes, they serve an important education opportunity for teaching students of all ages about riparian communities being hotspots of biodiversity, the importance of maintaining relict populations, and the potential of climate change to have devastating environmental impacts. Importantly, once established, these protected trees and shrubs can then be used as propagation stock for other restoration efforts throughout the high country. All stock will be propagated at the NAU Greenhouse Complex, which has supplied 500,000 trees and shrubs for restoration during the last few years. This facility will produce the planting material and once established will be ideally located to use the same material for propagation for other restoration sites in Arizona.

The Merriam-Powell Center for Environmental Research and the Cottonwood Ecology Group is enthusiastic about the opportunity to provide support and assistance for enhancing Sinclair Wash. Our group will make a long-term commitment of our experienced staff and time for the completion of this project. For example, this past year we planted over 30,000 cottonwoods and willows at restoration sites in Arizona, California and Utah. Although site conditions vary greatly, >90% of these plantings survived and we then replaced the ones that had died. Our experience shows that the most important problem with restoration projects is a lack of follow-up and long-term monitoring to ensure success. This problem has recently been reviewed in national publications and has been shown to be the major cause of restoration failures. Because our group is interested in studying the long-term effects of restoration on the community and ecosystem, high survivorship is required for us to complete our studies. In short, we have a vested interest in high survivorship and are committed to long-term monitoring. As evidence of our success in such efforts, we have been continuously funded for 30 years by the National Science Foundation, U.S. Department of Agriculture, Department of Energy, and/or Reclamation to study cottonwoods and willows and have published over 160 research papers on our findings. Our long-term success is based upon having successful enhancement/restoration sites that can then be used for research purposes. For example, our enhancements at a former Super Fund site in Utah now supports a gallery forest 60 feet tall, which supports a diverse community from microbes to birds and mammals. This site has been turned into the Ogden Nature Center, a locally supported education/outreach center that is visited by 1000s of children annually to help them learn more about nature, riparian restoration, and community ecology. At the same time, these plantings continue to provide valuable scientific information that becomes even more important as the site matures. We envision that a relict site on Sinclair Wash would have great research/education value. For example, as these relicts are the toughest of the toughest to have survived the drying out of the West since the last glaciers, they potentially have the most drought tolerant genes of any cottonwoods in the world. Understanding these long-term drought survivors could help future restoration biologists deal with one of the most important issues of our time – i.e., the maintenance of biodiversity in the face of climate change. The research/education value of having an 'in house' teaching/research laboratory at Northern Arizona University would be great.

Lastly, because the proposed riparian enhancement site is on public property at a University that advertizes itself as the 'environmental' campus, the University also has its reputation at stake to make sure this project succeeds. We agree to work closely with the grantee and technical staff, as well as other stakeholders to see this project to completion and to help with its success into the future.

If you have any questions or concerns, please contact me.

Sincerely,



Thomas G. Whitham, Regents' Professor
Department of Biological Sciences &
Executive Director, Merriam-Powell Center for Environmental Research
Northern Arizona University
Flagstaff, AZ 86011

Thomas.Whitham@nau.edu

Northern Arizona AUDUBON

June 6, 2008

Arizona Water Protection Fund Commission
Arizona Department of Water Resources
3550 N. Central Ave.
Phoenix, Arizona 85012

Re: Sinclair Wash Enhancement Project

Dear Arizona Water Protection Fund Commissioners:

The Northern Arizona Audubon Society would like to express its support for the Sinclair Wash Enhancement Project located in Flagstaff, Arizona on Northern Arizona University. As a stakeholder, we appreciate the opportunity the project provides to enhance riparian corridor function as bird and wildlife habitat in this urban environment.

We understand that the purpose of the project is to enhance native plant communities and improve the stream function of the wash. This project will also provide many benefits to the university community by providing and outdoor classroom within walking distance of regular classrooms. After the wash is re-vegetated with native species, Sinclair Wash will not only provide great bird and wildlife habitat, but also many opportunities for the community to enjoy riparian green space within city limits.

Northern Arizona Audubon is very interested in seeing Sinclair Wash enhanced, as studies we've conducted, as part of our nomination of Sinclair wash as an "Arizona Important Bird Area", show an unusually high number of bird species using Sinclair Wash, many of which are currently on National Audubon's "species of concern" list.

Northern Arizona Audubon recognizes the investment in this project requested of the AWPF and is enthusiastic about the opportunity to provide support and assistance for enhancing Sinclair Wash. We will promote the value of this project to our membership and encourage them to volunteer generously with their time to help remove invasive plant and restore natives to this riparian area. We agree to work closely with the grantee and technical support as well as other stakeholders to see this project to completion and to help with its success into the future.

If you have any questions or concerns, please do not hesitate to contact me.

Sincerely,

Kathie Satterfield

Kathie Satterfield
928-522-0375

THE STATE OF ARIZONA
GAME AND FISH DEPARTMENT
2221 WEST GREENWAY ROAD
PHOENIX, AZ 85023-4399
(602) 942-3000 • AZGFD.GOV
REGION II, 3500 S. LAKE MARY ROAD, FLAGSTAFF, AZ 86001

GOVERNOR
JANET NAPOLITANO
COMMISSIONERS
CHAIRMAN, MICHAEL M. GOLIGHTLY, FLAGSTAFF
WILLIAM H. MCLEAN, GOLD CANYON
BOB HERNBRODE, TUCSON
JENNIFER L. MARTIN, PHOENIX
ROBERT R. WOODHOUSE, ROLL
DIRECTOR
DUANE L. SHROUFE
DEPUTY DIRECTOR
STEVE K. FERRELL

May 14, 2008

Arizona Water Protection Fund Commission
Arizona Department of Water Resources
3550 N. Central Ave.
Phoenix, Arizona 85012

Re: Sinclair Wash Enhancement Project

Dear Arizona Water Protection Fund Commissioners:

The Arizona Game and Fish Department supports the Sinclair Wash Enhancement Project located in Flagstaff, Arizona on Northern Arizona University property. As a stakeholder, we appreciate the opportunity the project provides to enhance riparian corridor function and wildlife habitat in this urban environment.

We understand the project's purpose is to enhance native plant communities and improve stream function. This project will provide many benefits and educational opportunities to the university community within walking distance from the classroom. After the wash is re-vegetated with native species, Sinclair Wash will act as a wildlife corridor and provide many opportunities for the community to enjoy riparian green space within city limits. Riparian areas provide some of the rarest habitat for wildlife in Arizona, and the Department is especially interested in enhancing Sinclair Wash for the benefit of migratory birds.

The Sinclair Wash Enhancement Project will also provide a unique wildlife-watching opportunity. Fewer and fewer children are spending time outdoors, and wildlife agencies are feeling the impacts of this diminishing connection between people and wildlife. Restoring riparian wildlife habitat in an urban setting will provide children and adults the chance to experience wildlife without traveling beyond city limits.

The Department recognizes the investment in this project requested of the AWPF and is enthusiastic about the opportunity to provide support and assistance for enhancing Sinclair Wash. We agree to work closely with the grantee, technical support, and other stakeholders to see this project to completion and to help with its success into the future.

If you have any questions or concerns, please do not hesitate to contact me.

Sincerely,

Sarah Lantz
Urban Wildlife Planner, Region II Flagstaff Office

NORTHERN ARIZONA
UNIVERSITY
College of Engineering & Natural Sciences

Biological Sciences

Northern Arizona University
PO Box 5640
Flagstaff, AZ 86011-5640

928-523-2381
928-523-7500 fax
nau.edu/cens

Arizona Water Protection Fund Commission
Arizona Department of Water Resources
3550 N. Central Ave.
Phoenix, Arizona 85012

May 15 2008

Re: Sinclair Wash Enhancement Project

Dear Arizona Water Protection Fund Commissioners:

The NAU Student Chapter of The Wildlife Society would like to express its support and offer its assistance for the Sinclair Wash Enhancement Project located in Flagstaff, Arizona on Northern Arizona University and City of Flagstaff property. As a stakeholder, we appreciate the opportunity the project provides to enhance riparian corridor function and wildlife habitat in this urban environment.

We understand that the purpose of the project is to enhance native plant communities and improve the stream function of the wash. This project will also provide many benefits to the university community and provide educational opportunities within walking distance from the classroom. After the wash is re-vegetated with native species, Sinclair Wash will act as a wildlife corridor and provide many opportunities for the community to enjoy riparian green space within city limits. It will be especially beneficial as a "living classroom" for students in Biology, Environmental Sciences and Forestry here at NAU.

The NAU Student Chapter of The Wildlife Society recognizes the investment in this project requested of the AWPF and is enthusiastic about the opportunity to provide support and assistance for enhancing Sinclair Wash. Our organization is willing to offer 50-200 volunteer hours of labor to help with the revegetation. We agree to work closely with the grantee and technical support as well as other stakeholders to see this project to completion and to help with its success into the future.

If you have any questions or concerns, please do not hesitate to contact me.

Sincerely,

Tad Theimer
Associate professor and Faculty Advisor

NORTHERN ARIZONA UNIVERSITY

CENTER FOR ENVIRONMENTAL SCIENCES & EDUCATION

FLAGSTAFF, ARIZONA 86011-5694
(928) 523-3329 ROD.PARNELL@NAU.EDU

May 6, 2008

Arizona Water Protection Fund Commission
Arizona Department of Water Resources
3550 N. Central Ave.
Phoenix, Arizona 85012

Re: Sinclair Wash Enhancement Project

Dear Arizona Water Protection Fund Commissioners:

The NAU Center for Environmental Sciences and Education (CESE) would like to express its support for the Sinclair Wash Enhancement Project located in Flagstaff, Arizona on Northern Arizona University. As a stakeholder, we appreciate the opportunity the project provides to enhance riparian corridor function and wildlife habitat in this urban environment.

We understand that the purpose of the project is to enhance native plant communities and improve the stream function of the wash. This project will also provide many benefits to the university community and provide educational opportunities within walking distance from the classroom. We have conducted basics cross-sectional surveys and plant inventories for this reach of the wash for a lab exercise in ENV 230 Foundations of Environmental Sciences. This site, and the proposed enhancement activities, would provide an excellent outdoor laboratory for our majors' courses. After the wash is re-vegetated with native species, Sinclair Wash will act as a wildlife corridor and provide many opportunities for the community to enjoy riparian green space within city limits.

CESE recognizes the investment in this project requested of the AWPF and is enthusiastic about the opportunity to provide support and assistance for enhancing Sinclair Wash. We will be happy to continue to participate through monitoring progress of enhancement activities of this project as far as labs will permit. We agree to work closely with the grantee and technical support as well as other stakeholders to see this project to completion and to help with its success into the future.

If you have any questions or concerns, please do not hesitate to contact me.

Sincerely,

Robin A. Parnell

Dr. Rod Parnell
Director, Center for Environmental Sciences and Education
Interim Director, Center for Sustainable Environments

Paul Beier
Professor of Conservation Biology &
Wildlife Ecology
Flagstaff AZ 86011-5018 USA
Phone: 1-928-523-9341
paul.beier@nau.edu
website: http://oak.ucc.nau.edu/pb1

NORTHERN ARIZONA UNIVERSITY
School of Forestry

May 23, 2008

RE: Sinclair Wash Restoration Proposal

I am writing to strongly support the proposal to restore Sinclair Wash from Milton Road to San Francisco Street. My interest in this matter is solely that of a regular user of the Flagstaff Urban Trail System, and someone who appreciates having semblance of natural ecosystems in urban areas. I have no intention of being a consultant or otherwise getting any financial benefit from the project.

This section of Sinclair Wash is heavily used by pedestrians, runners, and cyclists who use the FUTS trail that runs along the Wash. I am one of the persons who regularly uses this section of the FUTS as part of my daily commute. In spring 2006, a gray fox mother denned and raised a litter of pups in the rocky slope where Sinclair Wash crosses under San Francisco street, right in the middle of the project area. With riparian willows restored, I'm sure this area would be home to warblers and other riparian birds, as well as bobcats, skunks, porcupines, and other animals. This already pleasant area could become a real jewel of the FUTS. It would provide opportunities for K-12 field trips, and for wildlife viewing by NAU students and southside residents, many of whom do not have cars to travel to wilder areas.

Do not hesitate to email or phone me if you have any questions. Thank you.

Sincerely,

Paul Beier

NORTHERN ARIZONA UNIVERSITY

Ecological Monitoring & Assessment Program & Foundation

Northern Arizona University
PO Box 5845
Flagstaff, AZ 86011-5845

928-523-0718
928-523-0717 fa
www.EMAprogr

Arizona Water Protection Fund Commission
Arizona Department of Water Resources
3550 N. Central Ave.
Phoenix, Arizona 85012

May 21, 2008

Re: Sinclair Wash Enhancement Project

Dear Arizona Water Protection Fund Commissioners:

On behalf of the Ecological Monitoring & Assessment (EMA) Program I would like to express my support for the Sinclair Wash Enhancement Project located in Flagstaff, Arizona on Northern Arizona University property. As a stakeholder, we appreciate the opportunity the project provides to enhance riparian corridor function and wildlife habitat in this urban environment.

We understand that the purpose of the project is to enhance native plant communities and improve the stream function of the wash. This project will also provide many benefits to the university community and provide educational opportunities within walking distance from classrooms. After the wash is re-vegetated with native species, Sinclair Wash will act as a wildlife corridor and provide many opportunities for the community to enjoy riparian green space within city limits. The EMA Program with student participation will assist with outreach and education planning which will target the university and greater Flagstaff communities to present the project and the resulting enhanced habitat. The EMA program will implement five outreach events (depending on funding) including NAU students, faculty and staff participating in clean-ups in the wash area to ensure riparian health.

The EMA Program recognizes the investment in this project requested of the AWPF and is enthusiastic about the opportunity to provide support and assistance for enhancing Sinclair Wash. We agree to work closely with the grantee and technical support as well as other stakeholders to see this project to completion and to help with its success into the future.

If you have any questions or concerns, please do not hesitate to contact me.

Sincerely,

Karan L English

Karan English, Director

ECOLOGICAL MONITORING & ASSESSMENT

Willow Bend
ENVIRONMENTAL
EDUCATION CENTER
703 E. Sawmill Road • Flagstaff, Arizona 86001
Phone/Fax: 928-779-1745

Arizona Water Protection Fund Commission
Arizona Department of Water Resources
3550 N. Central Ave.
Phoenix, Arizona 85012

May 13, 2008

Re: Sinclair Wash Enhancement Project

Dear Arizona Water Protection Fund Commissioners:

I am writing to express Willow Bend Environmental Education Center's support for the Sinclair Wash Enhancement Project located in Flagstaff, Arizona on Northern Arizona University campus. As environmental educators, we appreciate the opportunity the project provides to enhance riparian corridor function and wildlife habitat in this urban environment.

We understand that the purpose of the project is to enhance native plant communities and improve the stream function of the wash. This project will also provide many benefits to the Flagstaff community and provide educational opportunities within walking distance from the classroom. After the wash is re-vegetated with native species, Sinclair Wash will act as a wildlife corridor and provide many opportunities for the community to enjoy riparian green space within city limits.

Willow Bend has a 30-year history of providing hands-on Environmental Education in the greater Flagstaff area to K-12 students and their families. Our passive-solar straw-bale education center is located within a quarter mile of the project area. We are excited about the watershed enhancement project and the opportunity that the grant provides to create new 3rd grade and middle/high school plant identification programs with associated field trips into Sinclair Wash. In addition, we would teach programs on invasive plants and the importance of native vegetation.

Willow Bend recognizes the investment in this project requested of the AWPF and is enthusiastic about the opportunity to provide support and assistance for enhancing Sinclair Wash. We agree to work closely with the grantee and technical support as well as other stakeholders to see this project to completion and to help with its success into the future.

THE ARBORETUM AT FLAGSTAFF

TRANSITION ZONE HORTICULTURAL INSTITUTE, INC.

Arizona Water Protection Fund Commission
Arizona Department of Water Resources
3550 N. Central Ave.
Phoenix, Arizona 85012

May 28, 2008

Re: Sinclair Wash Enhancement Project

Dear Arizona Water Protection Fund Commissioners:

The Arboretum at Flagstaff would like to express its support for the Sinclair Wash Enhancement Project located in Flagstaff, Arizona on Northern Arizona University. As a stakeholder, we appreciate the opportunity the project provides to enhance riparian corridor function and wildlife habitat in this urban environment.

We understand that the purpose of the project is to enhance native plant communities and improve the stream function of the wash. This project will also provide many benefits to the university community and provide educational opportunities within walking distance from the classroom. After the wash is re-vegetated with native species, Sinclair Wash will act as a wildlife corridor and provide many opportunities for the community to enjoy riparian green space within city limits. Our organization fully supports projects that contribute to the appreciation and conservation of plants and communities of the Colorado Plateau. Furthermore, this project will provide a useful reference tool for visitors that are curious about riparian areas in Arizona.

The Arboretum at Flagstaff recognizes the investment in this project requested of the AWPF and is enthusiastic about the opportunity to provide support and assistance for enhancing Sinclair Wash. We are willing to offer assistance with various aspects of this project, which are yet to be determined. Because our mission compliments the project goals, we have a vested interest. We agree to work closely with the grantee and technical support as well as other stakeholders to see this project to completion and to help with its success into the future.

If you have any questions or concerns, please do not hesitate to contact me.

Sincerely,

Kristin E. Haskins
Research Scientist
The Arboretum at Flagstaff
928-774-1442 ext. 114

Evidence of Control and Tenure of Land

The project area is entirely within NAU property boundaries.
Included is documentation showing land gifted to NAU at the upstream end of the project.

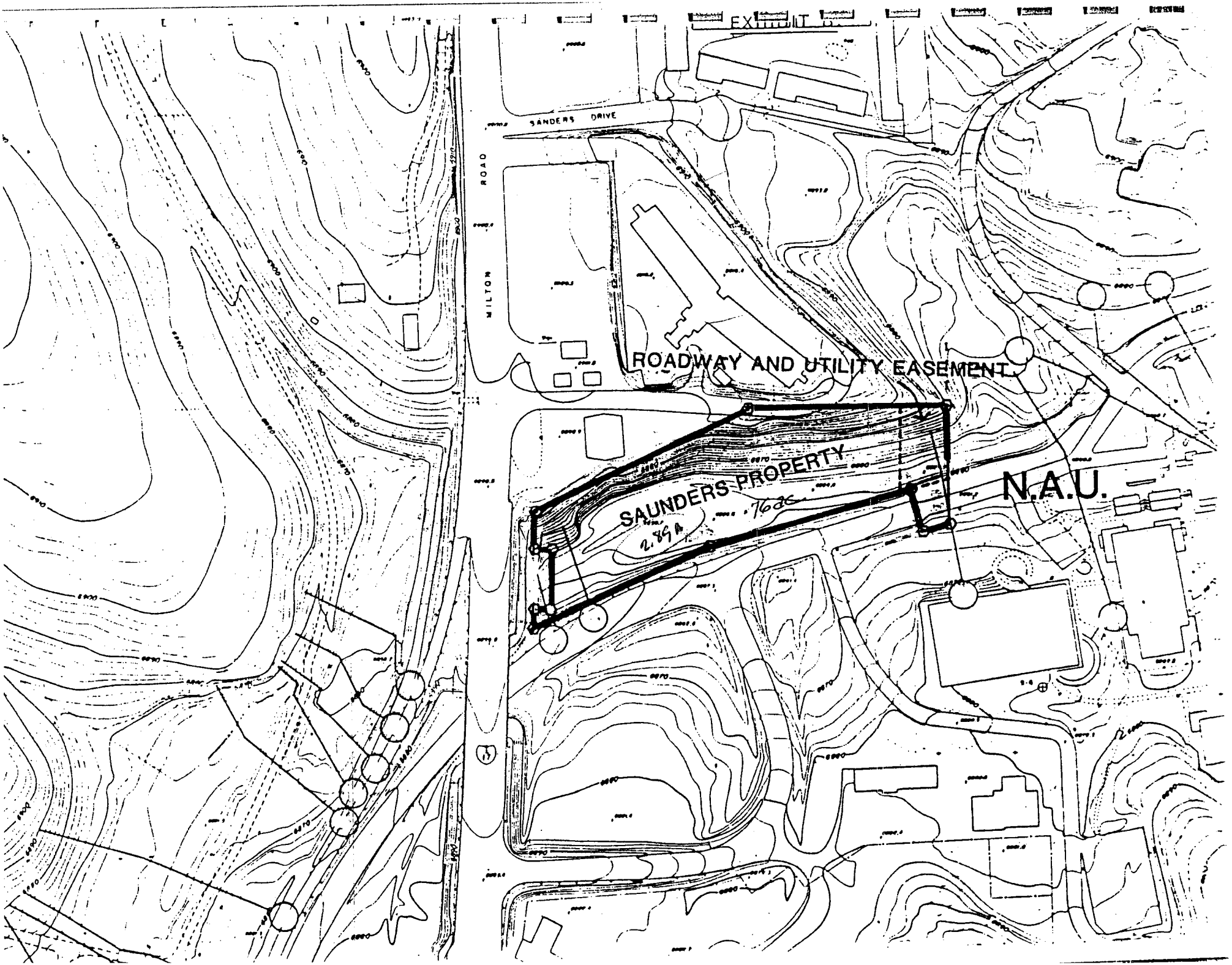


EXHIBIT
SANDERS DRIVE
MILTON ROAD
ROADWAY AND UTILITY EASEMENT
SAUNDERS PROPERTY
2.89 ± 76ac
N.A.U.

Milton Road/ I-17
2,821 AC
70
9

Evidence of Physical and Legal Availability of Water

Attached is the reclaimed water agreement between NAU and the City of Flagstaff that shows that NAU has the capacity to supply the project site with temporary supplemental irrigation. A support letter stating commitment to this end is included in the Community Support Letters section of the Supplemental Information Packet from NAU, Capital Assets and Services.

6/12/07

INTERGOVERNMENTAL AGREEMENT
Between
The City of Flagstaff
And
Northern Arizona University

THIS INTERGOVERNMENTAL AGREEMENT ("Agreement") is made and entered into this __ day of _____, 2007~~6~~, between the CITY OF FLAGSTAFF, a municipal corporation of the State of Arizona, whose address is 211 West Aspen Avenue, Flagstaff, Arizona 86001 (hereinafter "City"), and the Arizona Board of Regents, acting for and on behalf of Northern Arizona University ("NAU"), a State university duly organized and existing pursuant to Arizona Revised Statutes § 15-1601.A. with its address at Babbitt Administrative Center Room 100, Building 51, Knoles Drive, Flagstaff, Arizona 86011-4130~~NORTHERN ARIZONA UNIVERSITY, a political subdivision of the State of Arizona, whose address is, South San Francisco Street, Flagstaff, Arizona 86011, (hereinafter "NAU").~~

RECITALS

NAU desires to purchase treated sewage effluent ("Reclaimed Water") from the City of Flagstaff Wastewater Treatment Plants to be used for irrigation of open access landscaped areas on the campus of NAU and at other NAU facility locations as needed and located within the City's Reclaimed Water service area.

The City desires to sell Reclaimed Water to NAU upon the terms and conditions set forth below.

NOW, THEREFORE, pursuant to Arizona Revised Statutes ("A.R.S.") § 11-952(A), authorizing contracts between public agencies for services, the inherent powers of each party to protect the health and welfare of its citizens and in consideration of the mutual covenants contained in this Agreement, the parties agree as follows:

AGREEMENT

1. DEFINITIONS.

EFFLUENT - Means wastewater that has completed its passage through a wastewater treatment process.

OPEN ACCESS IRRIGATION SITE - Means that access to the Reclaimed Water by the general public is uncontrolled.

POINT OF DELIVERY - Means a location designated by the City for acceptance and measuring of the Reclaimed Water by NAU. The point of delivery may include a vault, pit, meter, valves and other appurtenances necessary to meter Reclaimed Water to the NAU campus.

POTABLE WATER - Means water that does not contain pollution, contamination, objectionable minerals or infective agents and is considered satisfactory for domestic consumption.

RECLAIMED WATER - Effluent which meets the standards for the specific reuses contained in the Arizona Administrative Code ("A.A.C.") § R18-11 (Article 3) and which is produced at the City of Flagstaff Wastewater Treatment Plants.

2. PURCHASE AND SALE. NAU agrees to purchase from the City Reclaimed Water from the City of Flagstaff Wastewater Treatment Plants to be used for irrigation of open access landscaped areas as further described in this Agreement; and the City agrees to sell Reclaimed Water to NAU in accordance with the terms and conditions set forth below.

3. REGULATIONS AND DELIVERIES. All deliveries of Reclaimed Water shall be made in accordance with the City's ordinances, rules and regulations. NAU shall obtain any additional City, state or federal permits for the use of Reclaimed Water for irrigation of open access landscaped areas should such permits become necessary in the future. As a courtesy and not as an obligation, the City shall endeavor to advise NAU of any such permit requirements of which the City becomes aware. NAU shall use the Reclaimed Water in accordance with applicable federal laws, including, but not limited to, the regulations of the Environmental Protection Agency, applicable laws of the State of Arizona, including, but not limited to, the rules and regulations of the Arizona Department of Environmental Quality; provided, however, that in the event any such laws or regulations shall be amended in the future so as to make it impossible or infeasible for NAU to use the Reclaimed Water, NAU, at its option, shall have the right to cancel and terminate this Agreement upon giving thirty (30) days notice in writing to the City. NAU shall also abide by the conditions of the City's permit for reuse of Reclaimed Water (issued by the State of Arizona to the City) and NAU agrees, in addition, to comply with the following requirements:

a. Hose bibs discharging Reclaimed Water shall be secured to prevent any use by the public.
b. Irrigation pipe shall be color coded, buried with colored tape or otherwise suitably marked to indicate nonpotable water.
c. Irrigation shall be conducted only at such times as to minimize contact with the public and to keep irrigated areas reasonably dry and free from standing or ponding water during normal usage.
d. Signs reading "Irrigation with Reclaimed Water, do not drink" or similar warnings shall be prominently displayed at each reuse site. Signs shall be placed at all logical points of entry to the site, at the entrance to all lakes and ponds, all plumbing outlets and hose bibs providing Reclaimed Water.
e. Drinking water fountains, potable water hose bibs and private residences shall not be exposed to the mist from sprinklers.

4. RECLAIMED WATER QUALITY. The City hereby agrees to provide Reclaimed Water under this Agreement that meets the quality requirements of the Reclaimed Water Reuse Permit issued by the Arizona Department of Environmental Quality to the City of Flagstaff. The City represents it is

now in compliance and shall attempt to remain in compliance with all regulatory and health and water laws, rules and regulations applicable to wastewater discharge. NAU acknowledges and agrees that the Reclaimed Water supplied under this Agreement is not intended or offered for potable use. Reclaimed Water delivered under this Agreement shall not be directly or indirectly utilized or transferred for uses other than irrigation of open access landscaped areas without the prior written consent of the City. NAU shall not be obligated to accept delivery of or to pay for inadequately treated Reclaimed Water which cannot, as received, be lawfully used for irrigation of open access landscaped areas in accordance with the rules and regulations of the Arizona Department of Environmental Quality. NAU assumes all risks and liabilities in connection with the use of Reclaimed Water, which meets the quality requirements of the City's Reclaimed Water Reuse Permit, described above and agrees that its remedies against the City for any breach of this Agreement by the City are limited to refusal to accept delivery.

5. RESPONSIBILITY FOR DAMAGE. The City shall not be liable for any damage to NAU or its property arising out of or resulting from curtailment, interruption or apportionment of the supply of Reclaimed Water occasioned by repairs or maintenance of the City's sewerage system, threatened or actual Reclaimed Water shortage or other causes beyond the City's control.

6. CONTRACT TERM. The term of this Agreement shall be for a period of five (5) years from the date Reclaimed Water is made available to NAU at the point of delivery. NAU may renew this Agreement for one (1) additional five (5) year period by notifying the City thereof, in writing, at least forty-five (45) days prior to the expiration of the initial term of this Agreement, which renewal shall be contingent on the City's receiving renewal of the City's permit for reuse of Reclaimed Water from the Arizona Department of Environmental Quality and upon NAU fulfilling its obligations under this Agreement. The terms and conditions of the renewed Agreement shall be subject to any City, state and federal regulations in effect at the time of renewal.

7. RECLAIMED WATER RATE. NAU agrees to pay the City for the treatment and delivery of all Reclaimed Water acquired at the Point of Delivery. The rate shall be that rate established by the Flagstaff City Council and set forth in the City Code of Flagstaff, Arizona. For the term of this Agreement, and any renewal hereof, the rate shall not exceed, on a per gallon basis, seventy-five percent (75%) of the then current commodity rate charged by the City for the sale of Potable Water used on the applicable property. In addition, NAU agrees to pay any applicable taxes, fees or surcharges that regulatory agencies may impose on Reclaimed Water. Provided that NAU and the City renew the term of this Agreement for an additional five (5) year period, NAU may recapture the costs incurred by NAU directly attributable to converting an existing irrigation system to use Reclaimed Water or extending public Reclaimed Water pipelines over a period of ten (10) years. Examples of said costs include installation and materials required for underground piping, meters, vaults, valves and other appurtenances necessary to convert existing irrigation systems to use Reclaimed Water. The City and NAU shall agree upon the amount of costs eligible for recapture prior to delivery of Reclaimed Water, and NAU may recover such costs through an annual rebate of ten percent (10%) of the total agreed upon costs of the extension and/or conversion. The City shall pay the rebate for the recovery of said costs annually starting from the end of the first year of actual

use by NAU of Reclaimed Water. Cost recovery shall not be allowed in the event that the parties do not extend the term of this Agreement for an additional five (5) year period, or if NAU ceases to use Reclaimed Water or the occurrence of any non-performance of this Agreement by NAU. If the City either fails to provide Reclaimed Water that meets the water quality requirements of this permit, or Reclaimed Water is not available to NAU and such non-availability is not excused pursuant to Section 20, Excusable Non-Performance, NAU cost recovery shall continue for that period of time Reclaimed Water is not available.

8. DEFAULT. In the event NAU fails to make payments when due or within ten (10) days thereafter, or fails to meet other terms of this Agreement, the City may terminate this Agreement upon giving thirty (30) days notice in writing to NAU. In the event NAU shall make all payments in default within thirty (30) days of such notice, or shall promptly correct the failure to meet the terms of this Agreement, this Agreement shall remain in full force and effect. In the event NAU fails to make all payments in default or to fulfill the other terms of this Agreement, the City shall have the right to suspend service of Reclaimed Water to NAU until any such defaults are cured.

9. INSURANCE; SELF-INSURANCE; INDEMNIFICATION. NAU shall maintain during the term of this Agreement adequate insurance coverage either through the State's Risk Management Division, which is a self-insurance program or otherwise, to cover any liability arising from the acts or omissions of NAU, its agents or employees relating to the performance of this Agreement. NAU shall not be responsible for maintaining insurance coverage for liability arising from the acts or omissions of the City's agents or employees. The City shall maintain adequate insurance or self-insurance to cover any liability arising from the acts or omissions of the City's agents or employees relating to the performance of this Agreement. The City shall not be responsible for maintaining insurance to cover liability arising from the acts or omissions of NAU's agents or employees. To the fullest extent permitted by law, each party (as "indemnitor") agrees to indemnify, defend, and hold harmless the other party (as "indemnitee") from and against any and all claims, losses, liability, costs, or expenses (including reasonable attorney's fees) (hereinafter collectively referred to as "claims") arising out of bodily injury of any person (including death) or property damage but only to the extent that such claims which result in vicarious/derivative liability to the indemnitee, are caused by the acts, omissions, negligence, misconduct, or other fault of the indemnitor, its officers, officials, agents, employees, or volunteers. The City shall be named an additional insured on any NAU insurance policy covering liability arising from NAU's acts or omissions under this Agreement, and any such policy shall not be cancelled without at least ten (10) days written notice to the City thereof. Promptly following the execution of this Agreement by the parties, NAU shall provide the City with a certificate of insurance with respect to such coverage and conditions.

10. USE OF RECLAIMED WATER BY OTHERS. NAU agrees that this Agreement shall not restrict the right of the City to use Reclaimed Water for City operations or to sell Reclaimed Water to others.

11. AMOUNT OF EFFLUENT. To the extent that the operation of the City of Flagstaff Wastewater Treatment Plants shall produce sufficient Reclaimed Water for all users of the City, the amount of Reclaimed Water delivered to NAU shall not be restricted.

12. OPERATION, MAINTENANCE AND REPLACEMENT COSTS. The operation, maintenance and replacement costs of the conveyance system beyond the Point of Delivery shall be the responsibility of NAU.

13. POINT OF DELIVERY. NAU shall install the vault, pit, meter, valves and other appurtenances that constitute the Point of Delivery, and these shall become the property of the City. NAU shall require that its contractor warrant all pipelines, vaults, pits, meters, valves and other appurtenances installed by such contractor for a period of one year from the date of final acceptance by the City. All appurtenances associated with the point of delivery shall be constructed and installed in accordance with City engineering standards or shall, otherwise, be approved by the City.

14. ACCEPTANCE AND TRANSMISSION OF RECLAIMED WATER. NAU shall assume all costs of and responsibility for transportation of the Reclaimed Water by means of a conveyance system downstream of the Point of Delivery, which shall be constructed, owned, operated and maintained by NAU.

15. PROTECTION OF CITY POTABLE WATER SYSTEM. NAU agrees to install City approved backflow prevention devices at all Potable Water service connections to the property served by the Point of Delivery. Such backflow prevention devices shall be installed, tested and made operational prior to the delivery of Reclaimed Wastewater to NAU by the City. Such backflow prevention devices shall be tested annually at NAU expense, and verification of such testing shall be provided to the City. Backflow prevention testing shall be done by a certified backflow prevention device tester in accordance with City regulations. The costs to NAU for the installation of backflow prevention devices shall be considered part of the cost of converting the water system to use Reclaimed Water unless such backflow devices would normally be required in accordance with State of Arizona regulations. The cost to NAU for the annual testing of backflow prevention devices shall not be considered part of the cost of converting the water system to use Reclaimed Water.

If Potable Water is used at the reuse site, the City shall perform a dye test on the reuse system that demonstrates to the satisfaction of the Coconino County Health Department that no cross-connections with Potable Water exist. This test shall be performed by the City prior to the delivery of Reclaimed Water to the reuse site. This requirement does not apply to reuse facilities specifically designed to use Reclaimed Water. A color coding system shall be used on all new piping and outlets to prevent any accidental cross-connection between the potable and reuse water supplies. The color code shall conform to the standards set forth by the Coconino County Health Department. Should a county color code not exist, purple shall be used for all reuse plumbing.

16. LOCATION OF IMPROVEMENTS. Any future NAU conveyance line and associated easements therefor on City property shall be located so as not to interfere with present or future City operations, and the location of all such improvements shall be approved, in advance and in writing, by the City.

17. LIMITATIONS ON USE. NAU shall use Reclaimed Water in accordance with the terms and conditions of this Agreement and only in the boundaries of the locations specified below and any additional locations agreed to by the City and NAU pursuant to this Agreement. NAU shall not sell Reclaimed Water within or without the boundaries of such locations to other users. Nothing in this Agreement shall be construed to obligate NAU to accept and deliver Reclaimed Water to lands in the absence of a need for irrigation thereon, or to prevent the disposition of Reclaimed Water through NAU drainage facilities, or to require the diversion of Reclaimed Water into NAU irrigation systems at such times or in such amount as to interfere with the proper operation and maintenance of such systems or to endanger the facilities thereof. NAU has identified the current specific reuse locations subject to this Agreement as the following:

NAU – Reclaimed Water System Phase One
NAU – Reclaimed Water System Phase Two
NAU – Reclaimed Water System Phase Three
NAU – Intramural Fields (identify in exhibits)
NAU – General Campus Locations (as added – with 60 day notification)

The aforesaid locations shall be shown on a plot plan, identified as EXHIBIT "A", an exhibit included with the Reuse Permit amendment application made by the City to the Arizona Department of Environmental Quality. The plot plan shall identify the irrigation system, containment structures (10 year, 24-hour storm), storm water flow paths and protection of the drinking water facilities. Approval for extensions of Reclaimed Water pipelines and uses for irrigation of areas other than those identified in EXHIBIT "A" shall be requested in writing by NAU and incorporated into this Agreement by administrative amendment along with an additional plot plan.

18. DISPOSAL OF EXCESS RECLAIMED WATER. Excess Reclaimed Water not used for irrigation by NAU shall be disposed of in the City's sanitary sewer system after notification to the City thereof by NAU and approval by the City. NAU shall notify the City's Utilities Department of any request to discharge Reclaimed Water into the City sanitary sewer system.

19. SUCCESSORS AND ASSIGNS. This Agreement shall be binding upon the successors and assigns of the City and NAU but shall not be assigned or transferred by NAU without the prior written consent of the City and the execution of a legally enforceable contract between NAU and any assignee or transferee. Any such contract shall be filed with the Arizona Department of Environmental Quality, and shall serve to notify any succeeding assignee or transferee of the

requirements of A.A.C. Title 18, Chapter 9, Article 2, and shall require any succeeding assignee or transferee to so contract with any additional succeeding assignee or transferee.

20. EXCUSABLE NON-PERFORMANCE. In the event of an act of God, natural catastrophe, war, civil insurrection, accidents, acts of governmental or judicial bodies other than the City, the failure of either party to perform its obligation under this Agreement shall be excused for so long as the condition interfering with performance continues. The maintenance and operation of the City's sewerage system and of the City's wastewater treatment plants shall be solely within the discretion of the City, and in the event the City discontinues the sewage treatment plant operation, or does not retain legal authority to provide Reclaimed Water, all obligations of either party to perform under this Agreement shall cease without prejudice to any claims or causes of action existing prior to the termination of this Agreement.

21. SEVERABILITY. In the event any portion of this Agreement shall be determined to be invalid, such invalidity shall not render the remaining portions of this Agreement void unless the deletion of the invalid portion shall materially and substantially alter the rights of the parties under the remaining portions of this Agreement.

22. CANCELLATION FOR CONFLICT OF INTEREST. This Agreement may be canceled either by the City or by NAU for conflict of interest in accordance with A.R.S. § 38-511.

23. FEES. The City agrees not to charge NAU for building inspection, building permit or other fees in connection with NAU construction and installation of any pipes, structures or other appurtenances necessary to accept, distribute and dispose of any Reclaimed Water under this Agreement.

24. DISPUTE RESOLUTION. If a dispute arises out of or relates to this Agreement, and if the dispute cannot be settled through negotiation, the parties agree first to try in good faith to resolve the dispute by mediation before resorting to litigation or some other dispute resolution procedure. Mediation shall be self-administered and conducted under the CPR Mediation Procedures established by the CPR Institute for Dispute Resolution, 366 Madison Avenue, New York, NY 10017, (212) 949-6490, www.cpradr.org, with the exception of the mediator selection provisions, unless other procedures are agreed upon by the parties. Unless the parties agree otherwise, the mediator(s) shall be selected from panels of mediators trained under the Alternative Dispute Resolution Program of the Coconino County Superior Court. Each party agrees to bear its own costs in mediation. The parties shall not be obligated to mediate if an indispensable party is unwilling to join the mediation. This mediation provision is not intended to constitute a waiver of the parties' right to initiate legal action if a dispute is not resolved through good faith negotiation or mediation, or if a party seeks provisional relief under the Arizona Rules of Civil Procedure.

25. AUTHORIZATION. The parties to this Agreement represent and warrant that the persons executing this Agreement on their behalves have full authority to bind the respective parties.

26. CAPTIONS. The captions used in this Agreement are for convenience only, are not a part of this Agreement and do not in any way limit or amplify this Agreement's terms and provisions.

27. CONSTRUCTION OF AGREEMENT. This Agreement has been arrived at by negotiation and shall not be construed against either party to it.

28. COUNTERPARTS. This Agreement may be executed in multiple counterparts, each of which shall constitute an original, but all of which together shall constitute one and the same instrument. The signature pages from one or more counterparts may be removed from the counterparts and attached to a single instrument so that the signatures of all parties may be physically attached to a single document.

29. ENTIRE AGREEMENT. This Agreement constitutes the entire agreement between the parties pertaining to the subject matter of this Agreement, and all prior and contemporaneous agreements, representations, negotiations and understandings of the parties, oral or written, are hereby superseded and merged into this Agreement, except as expressly provided elsewhere in this Agreement.

30. GOVERNING LAW. This Agreement shall be governed by and construed under the laws of the State of Arizona, and venue for any action under this Agreement shall be Coconino County, Arizona.

31. WAIVER. Any waiver granted by any party shall not be deemed effective except for the instance and in the circumstances particularly specified in the waiver and unless in writing, executed by the party against whom enforcement of the waiver is sought. No waiver by any party of a breach of any of the terms, covenants or conditions of this Agreement shall be construed or held to be a waiver of any other breach of the same or any other term, covenant or condition contained in this Agreement.

32. NO THIRD PARTY BENEFICIARIES. The parties acknowledge and agree that the terms, provisions and conditions of this Agreement are for the sole benefit of, and may be enforceable solely by, the parties to this Agreement, and none of the terms, provisions, conditions and obligations are for the benefit of or may be enforced by any person not a party to this Agreement.

33. SEVERABILITY. In the event that any phrase, clause, sentence, paragraph, section or other portion of this Agreement becomes illegal, null or void or against public policy for any reason, or is held by any court of competent jurisdiction to be illegal, null or void or against public policy, the remaining portions of this Agreement shall not be affected thereby and shall remain in force and effect to the fullest extent permitted by law.

34. MODIFICATION OF AGREEMENT. This Agreement may be amended at any time by written amendment executed by both parties. No modification of this Agreement shall be deemed effective unless in writing and signed by the parties.