

ARIZONA PIONEERS' HOME CEMETERY





A Plan for Erosion Control, Maintenance and Design at the Arizona Pioneers' Home Cemetery

Prepared for the Arizona Pioneers' Home by the Drachman Institute The University of Arizona May, 2009

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Prepared for: Arizona Pioneers' Home Cemetery Prescott, AZ

May, 2009

Funded in Part by: Arizona Pioneers' Home State of Arizona The Drachman Institute The Drachman Institute is a research and public service unit of the College of Architecture and Landscape Architecture at The University of Arizona dedicated to the environmentally sensitive and resource-conscious development of neighborhoods and communities. We engage our students, our staff, our faculty, and our citizens in a research-based outreach enterprise to make our communities healthier, safer, more equitable and more beautiful places to live.



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ACKNOWLEDGEMENTS

We would like to thank Gary Olson, Superintendent of the Arizona Pioneers' Home, and his wonderful staff for their help and guidance in developing the plans outlined in this document. In particular, conversations with Claude Duke and Jim Bachman helped us understand the on-the-ground issues at the cemetery. Dale Sams provided helpful survey and burial information. We are also grateful to Nancy Burgess for providing in-depth discussions of historic cemeteries in the Prescott area, and evaluation of the Arizona Pioneers' Home Cemetery as a candidate for the National Historic Register (it was not nominated).



INTRODUCTION





INTRODUCTION PROJECT DESCRIPTION

The Arizona Pioneers Home Cemetery, established in 1911, has honored the memory of many notable Arizonans throughout its history. Situated on a hill approximately 1.75 miles northwest of the Arizona Pioneers Home, the cemetery overlooks Prescott's city center with outstanding views of the surrounding mountains and forests. However, more recent commercial development has surrounded the cemetery, disrupting the quiet scenic beauty of the site. In addition, the cemetery is currently experiencing serious erosion problems, including loss of alarming amounts of topsoil during seasonal storms.

Maintenance practices appear to have been inconsistent in the past, with little long term planning for the care of the landscape and grounds. Erosion and loss of topsoil are accompanied by declining plant health over much of the site. Mature trees have recently been lost to drought and disease. In years past, watering the native grasses from spring through fall maintained the site with few erosion problems. Now however, due to drought conditions and watering restrictions, erosion has become an urgent problem.

Along with the erosion problems, drought and budgetary factors have made it increasingly difficult to maintain the cemetery grounds to a standard appropriate to the cemetery's significance as a landmark for the state and for the City of Prescott. This report presents a plan that will ensure that the cemetery continues to respect the honored Arizona citizens buried here by maintaining a beautiful landscape and preserving its historic character. The plan recommends appropriate design for preserving this character while minimizing the resources required for maintenance over the long term.

We suggest that this be done through a combination of strategies that includes installation of erosion control features, on-site storm water retention and water harvesting, and utilization of plants and other materials that honor the historic character of the cemetery. Our goal is to reestablish an attractive, historically appropriate landscape for the cemetery that conserves water, stabilizes the site, and minimizes maintenance needs.











INVENTORY



HISTORY / BACKGROUND ARIZONA PIONEERS' HOME

The Arizona Pioneers' Home is a State of Arizona agency (non-profit), and a community in and of itself. It currently operates as a continuing care retirement home that is funded by the State of Arizona, with an annual budget of approximately \$5 million (2008). The present capacity of the home is 150 residents, which includes people from all over the State of Arizona.

The Home, proposed by A.J. Doran, Frank M. Murphy and Johnny Duke, was originally intended for impoverished Arizona citizens who settled and helped build the state. A bill authorizing the Pioneers' home was signed into law by the Arizona Territorial Legislature in 1909. Two years later, on February 1, 1911, the Arizona Pioneers' Home opened its doors, and it has housed prominent and less well known Arizona residents ever since.

The land on which the Pioneers' Home sits was donated by Frank M. Murphy (original 4.5 ac) and T.G. Norris. The original building and its subsequent additions sits atop a prominent hill at the south end of McCormick Street. It has commanding views of the historic city center, as well as surrounding mountains and mesas.

Initially the home was built to house 40 men, but in 1916 a wing was added to house 20 women. Later, in

1929, the home again expanded to include Arizona's Hospital for Disabled Miners.

Today the Pioneers' Home admits "pioneers" who are over 70, have lived in Arizona for over 50 years, and have been a U.S. citizen for at least 5 years. The Pioneers' Home still serves disabled miners as well. Admission criteria for disabled miners can be found on the website: http://www.azph.gov/cemetery_ information.asp.

PIONEERS' HOME CEMETERY

The Arizona Pioneers' Home Cemetery was established in 1911, through donations of land from the Simmons family, and Dr. W. E. Day. It built upon an older private cemetery, the Simmons family section, which was established in 1864. The location of the cemetery is on a hill adjacent to Iron Springs Road in Prescott, Arizona, and it is surrounded by commercial businesses on multiple sides.

There are some notable individuals buried in the cemetery, namely Sharlot Hall, Mary K. Cummings (Big Nose Kate—Doc Holiday's girlfriend) and Albert Franklin Banta, discoverer of Meteor Crater. In addition to these people, this is the final resting place of many other Arizona pioneers who lived at the Arizona Pioneers' Home prior to their passing.





The Arizona Pioneers' Home has been given legislative authority to manage and maintain the historic Pioneers' Home Cemetery. To date, two areas on the property have available spaces:

- 1. The Simmons Cemetery section (near the original Simmons Family section); and
- 2. The "New Section," encompassing the open grassy areas on the lower portion of the property.

Current interment practices and policies are:

When interment is required, the Arizona Pioneers' Home must be contacted for opening and closing grave site instructions.

Ashes, in containers, may be placed in the grave site of an existing family member at no charge. Other designated areas are available for burial of ashes



at \$150 each. Placement of ashes is not regulated and may be done by anyone. Notice of burials must be given to the Arizona Pioneers' Home for record keeping purposes.

Regulations require that, in the New Section, gravestones be flat, and set so they sit no more than ¹/₄ inch above the ground. Holders for flowers must be inset for the same purpose. Metal pot-holders and rock or fence borders are not permitted.

The cemetery is maintained in natural vegetation with native grasses and other plants. No special plantings around graves are permitted and all grave decorations must be disposable so that mowing and maintenance can continue.

Source: Arizona Pioneers' Home Website: www.azph.gov

CONTEXT & CURRENT CONDITIONS LOCATION & CONDITIONS

The Arizona Pioneers' Home Cemetery is situated on a small hill northwest of downtown Prescott. It is surrounded by various types of commercial development. Any changes to the site will have to take into account the adjacent land uses, and give special consideration to appropriate drainage and storm water management.

On part of the north side of the cemetery, facing Walmart and other businesses, there is a steep drop off that could become a serious slope stability problem if erosion continues unchecked. Similar conditions exist on the eastern edge of the property, where other commercial development has cut somewhat into the existing hillside. Unfortunately, in both of these cases the worst conditions lie outside of the cemetery property, and are beyond Arizona Pioneers' Home control. However, soil stabilization measures can be taken on the cemetery to minimize erosion that would reach into these areas.

On the rest of the northern margin and on the western margin of the property, more robust erosion control measures have already been installed, including concrete channels that carry storm water off site and into a sewer drain. Here again, soil stabilization in these areas would further slow runoff and erosion during storms.





SITE CONDITIONS & PHOTOS

Other areas that have noticeable erosion problems include:

- Slopes near the entrance, where large amounts of soil wash across the entry road, through the gate and out onto Iron Springs Rd.
- The current burial area, between the lower and middle cemetery roads. Extensive sheet flow across both this and the future burial area (below and to the south) contributes substantially to the large volumes of soil lost on the site. These areas are further challenged by the need to maintain their accessibility to visitors and availability for future burial. This limits the number of erosion control features that can be used without interfering with the function of these areas.
- The hill side between the middle and upper (northern) road on the cemetery is an area of steeper slopes which

is largely covered in native vegetation. Where the vegetation is dense, soil stability is reasonably good. However, the density of the vegetation also made this a good spot for a homeless camp (now vacated). A challenge for this area is to increase the visibility without further destabilizing the slope.

These conditions will be discussed further in the sections on slope, soil and erosion control options.

An outstanding feature of the cemetery is the historic burial areas, particularly the Simmons Family area, and the area around Sharlot Hall's grave. These are the oldest burial areas on the site, and are marked with distinctive gravestones and a limited amount of fencing.

While the oldest sections of the cemetery are notable for

their grave site materials, other historic parts of the cemetery are notable for the style and alignment of the burial plots. In particular, the historic military burial section presents a striking array of headstones that is a quiet reminder of the sacrifices made by those buried there.

The remaining part of the historic section, which spans a period from about 1920 to 1950, has an unusual alignment of headstones and grave markers along low rock walls. This is one of the defining features of the cemetery, and should be managed in a way that will preserve the integrity of the rock walls over time.

The area around Sharlot Hall's grave has recently undergone some modifications, with the introduction of rock mulch ground cover and general cleanup of the site. Part of the challenge for future management of the cemetery will be to



allow for improvements and maintenance that does not detract from the historic character of these portions of the cemetery. A set of design guidelines is included in this document to help guide decisions when the need for modifications, repairs and maintenance arises in the future.

In addition, there is a small maintenance shed that lies adjacent to the oldest part of the historic section. Although a good location in terms of convenience, the shed's cinder block construction detracts from the historic qualities of this part of the cemetery.

Strips of river rock lining portions of the roads to reduce erosion have not been as effective as hoped, and present a maintenance problem. Options for changing these will be discussed in the erosion control plan.





VEGETATION

The site supports a range of both native and non-native vegetation. The cemetery lies within a zone of mountains and mesas that are characterized by interior chaparral plant communities. In this region, chaparral communities tend to be well adapted to seasonal precipitation concentrated in the summer (monsoon) and winter months. These plants also tend to be well-adapted to fire and are resistant to many pests and diseases (see comments below), making them relatively low maintenance overall.

Much of the site is blanketed in native grasses and forbs, with several non-native species noted as well. These constitute the bulk of the ground cover, which is sparse overall due to the coarse nature of the soil. Several non-grass, non-woody species are present, notably prickly pear cactus, banana yucca and nolina.

There are a number of large, healthy trees, including alligator juniper and Arizona cypress. Other native trees include an especially nice Emory oak, pinyon pine and shrub live oak. Although normally fairly pest resistant, these plants suffered from a severe bark beetle infestation a few years ago. They may also be susceptible to diseases or pests introduced to the area, typically by nursery-grown plants.

Non-native trees include Siberian elms and honey locusts. Locusts are planted along the lower loop road, and create a nice shaded border along the road. The elms are not recommended, however, as they tend to be invasive, become "weedy" looking, and generally require more maintenance than many of the native species.

There are several types of native and well-adapted non-native shrubs on the site as well. These include serviceberry, skunkbush (three leaf sumac), a type of Mahonia and possibly buckthorn. This variety indicates that many more native shrubs and small trees would be well adapted to the site, providing a broad variety of options for future plantings and plant replacement.

IRRIGATION

Because of recent water use ordinances and the cost of water, previously installed irrigation rotors are generally not used now. The rotors can be hooked up to hoses to manually irrigate portions of the site. Several hose bibs were noted on the site, and are assumed to be operational. One valve box was noted on the site, but it is not currently in use.

City water is currently available on site, and could be accessed for irrigation. However, there is presently no power into the site. Any future plantings that would require irrigation would need to rely on solar irrigation controllers, or power would need to be brought into the site. Solar controllers are quite common these days, and are reported to be no more maintenance than traditional controllers.

















ELEVATION & SLOPE MAPS

The maps below show the elevation change and slope gradient across the property. These values are calculated from digital elevation models provided by the U.S. Geological Survey.

Although the slope is moderate across most of the site, in the 7-15% range, this is steep enough to cause the extensive erosion problems observed on the property.

Approximately one third of the site has moderately steep to very steep slopes, which contribute substantially to the erosion problems. These steeper slopes are concentrated along the south-facing hillside that is currently covered with native vegetation. Much of this hillside is not used for burial, so a variety of erosion control features could be used here to stabilize the slope, retaining both soil and water during storms. Other areas that would benefit from constructed erosion
control features include:Note that the contours shown below do not reflect the steep
gradients immediately off site caused by recent construction
activity.

- The middle road, between current and future burial areas;
- A small area near the entry; and
- The fence line areas on the east, north and west boundaries of the cemetery.





SOILS

A major factor contributing to the erosion problems on the site is the coarse grained nature of the soils. According to the Natural Resources Conservation Service Soil Survey, the entire property is underlain by the Balon soil unit. This unit consists of sandy loam on slopes up to 15%, and gravelly sandy clay loam on slopes up to 30%. Both types of soil are found on the cemetery site. These soils are noted for their slope erodibility potential.

These soils are classified as well drained, with no restrictive layers (e.g., caliche) within 60" of the surface. Organic content is low, about 2% in near surface layers. These are not hydric soils, and there are no zones of saturation within 72" of the surface. Shrink-swell potential of these soils is low. There are no problems with salinity, gypsum or calcium carbonate content.

The site lies within an area with a mean annual precipitation of 12 - 16". The number of frost-free days can vary from 145 to 225. These factors, combined with the soil type, influence what type of plants, especially ground covers, might be suitable for the site.

The properties of the soils on this site give rise to a limited capacity for holding water. Irrigation needs will be higher in these soils than in finer grained, more organic rich soils. For these reasons, it is suggested that plants native to sandy loam upland areas of this region be used across most of the site. They may be supplemented with ornamental plants that are very well adapted to the local conditions, on a limited basis.









SOIL MAP LEGEND

Balon Sandy Loam, 0 to 15% slopes

Balon Gravelly Sandy Clay Loam, 5 to 30% slopes

Lynx Soils

Rock Land

Cordes Sandy Loam

Barkerville Extremely Rocky Sandy Loam, 20 to 60% slopes





MASTER PLAN



MASTER PLAN DESIGN CONCEPTS





ENTRY SEQUENCE

- Enhance entry signage on Iron Springs Rd
- Install solar-powered lighting: lamp posts, sign lighting
- Install gateway feature or new sign similar in style to the Arizona Pioneers' Home signs.
- Use mixed perennial plantings inside and outside of fence to highlight entry to the cemetery
- Use water collection and infiltration features, particularly inside fence to capture and control runoff
- Include multiple sizes of boulders, rock mulch for stabilization and to reduce maintenance
- Include signage on existing low rock walls
- Enhance plantings at existing low rock walls, including ornamental trees to aid in wayfinding
- Enlarge and extend low rock walls to mitigate erosion and soil creep



RECENT & CURRENT BURIAL

- Soil stabilization techniques: ground scraping with buffalo grass (or similar) hydroseeding on top; geotextile installation in areas not used for burial with hydroseeding on top
- Road edge definition & enhancement to include low rock walls, parking pull-outs, perennial plantings, boulders
- Directional water collection swales +/or concrete channels
- Provide a limited number of benches
- Ornamental trees in select locations, such as around benches
- Remove maintenance shed and relocate spoils stockpile to eastern edge of property, accessible from loop road
- Enhance plantings on southern and eastern edges of property to screen commercial buildings; remove planted and 'volunteer' elm trees
- Provide limited informational signage



SCRUB OAK HILLSIDE

- Replace maintenance shed with small, open air Introduce mixed perennial planting groups with ramada
- Develop "Memory Path" for storing cremated remains, with ossuary niche walls, burial rocks/ burial pavers and a limited number of benches
- Thin and enhance existing native vegetation to stabilize slope
- Introduce perennials and ornamental grasses along paths with water collection / infiltration features
- Use multiple sizes of rocks/boulders/gravel to enhance erosion control
- Plant ornamental trees selectively to enhance look of native vegetation and to aid in wayfinding
- Replace grass with fine gravel or decomposed granite at the existing memorial
- Define new "Viewpoint" area with decomposed granite to create visual connection between the cemetery and the Pioneers' Home



HISTORIC BURIAL

- water harvesting design
- Provide interpretive signage for historic sections of cemetery
- Use boulders, rock mulch in conjunction with perennial plantings to stabilize areas that will not have future burial
- Provide a limited number of benches
- Consider installing gravel or decomposed granite path leading from ramada area around northern perimeter of the cemetery, back to existing memorial to provide better access to historic burial areas



LINEAR ROCK WALL BURIAL

- Rock wall restoration & maintenance: replace missing rock, rearrange where shifting has occurred; remove 'volunteer' plants where necessary
- Head stone maintenance; stabilize and correct stones that have fallen over; prevention in the case of those that are currently ok
- Ground-cover (buffalo grass or similar) in between rows
- Consider uniform perennial plantings to help accent the linear form of the rock walls
- Provide limited informational signage



NORTHWEST CORNER

- Install geomesh and hydroseed with buffalo grass or similar to stabilize soil
- Create shallow vegetated swales near edge of property to capture and slow runoff
- Enhance edge plantings as necessary to additionally slow runoff and screen adjacent road, commercial areas

MASTER PLAN

The master plan shown to the right illustrates possible locations of elements described in the design concepts on the preceding pages. Images on the following page show the intended character of some of the proposed features. New features proposed in the master plan include:

- Enhanced ornamental plantings and a new sign similar to the Pioneers' Home sign at the entrance to the cemetery.
- Parking pullouts on stabilized soil or permeable pavers along the lower and middle road. Parking pullouts would be combined with low rock or keystone walls along the middle road to further control erosion on the uphill side.
- Rock lined vegetated swales and small infiltration basins along the driveway and lower roads to trap water and sediment (see Erosion Control Plan).
- Removal of the existing maintenance shed, to be replaced with a small ramada for services or other events.
- Installation of a "Memory Walk" that would incorporate niche walls and paver vaults for cremated remains.
- Regrading and redistribution of the spoils stockpile to provide a viewpoint from which the Arizona Pioneers' Home can be seen.
- A few benches selectively placed in areas that regularly get visitors, such as the current burial area and at the Viewpoint.
- Cleanup and enhancement of ornamental plantings around the existing memorial.
- Addition of a stabilized soil path along the northern margin of the cemetery to improve access to the historic sections.
- Replacement of existing elm trees with groups of native trees and large shrubs along the edges of the property to screen the cemetery from adjacent commercial areas.



TWO STYLES OF BENCHES FOR SEATING AREAS.



MASTER PLAN - CHARACTER SKETCHES



NICHE WALL FOR CREMATED REMAINS.



VIEW LOOKING UP "MEMORY PATH."



VISITOR PARKED IN PULLOUT ALONG MIDDLE ROAD.



ENTRY MONUMENT WITH INFORMATIONAL SIGN AND ENHANCED ORNAMENTAL PLANTINGS.



VEGETATED INFILTRATION BASIN AT SOUTHEAST CORNER OF PROPERTY WITH ENHANCED PLANTINGS FOR SCREENING



RAMADA FOR SERVICES OR SMALL GATHERINGS.

MASTER PLAN - PRIORITY AREAS

Two priority areas for implementing erosion control and landscape improvements have been identified by Pioneers' Home management. The plan on this page shows the highest priority area, centered around the current / future burial area. Specific types of plants are suggested here, along with other features such as parking areas and benches.

Three phases of implementation are suggested:

- 1. Reseed current and future burial areas with a buffalo grass seed mix. This should be done by hydroseeding (see Design Guidelines section for alternative methods of seeding). Ideally, the area would be prepared by applying an herbicide to kill unwanted types of grass and weeds prior to hydroseeding. If this is not possible, rake or lightly till the surface to be seeded before application. Hydroseeding should be done in June to take advantage of the summer monsoons.
- 2. Create vegetated swales along the margins of the roadway. Swales should be constructed using a small backhoe or similar type of equipment in a way that minimizes soil compaction. They can be hydroseeded with buffalo grass seed mix, but ideally will also include an infiltration trench that drains to shallow detention basins at either end of the roadways. See the Erosion Control Plan in this document for more information about how to construct a vegetated swale. Enhanced ornamental plantings should be installed when the swales and basins are constructed, along with localized drip irrigation to serve plants that benefit from regular watering. Most of the plants suggested in this plan do not need supplemental irrigation once established, but should have regular watering for the first 2 years (once every 1-2 weeks in the growing season).
- 3. Construct low retaining walls and parking pullouts on the middle and lower roads. Walls should be masonry (rock or keystone block). Parking pullouts should be paved with permeable paving stone, and filled with either gravel or buffalo grass. Small bridges across the swales can also be installed at this time, along with benches, as shown on the plan.



Arizona Pioneers' Home Cemetery Prescott, Arizona



SYMBOL	BOTANICAL NAME	COMMON NAME NOTES			
ECIDUOUS TREES					
•	Juniperus deppeana	Alligator Juniper			
	Cupressus arizonica	Arizona cypress			
	Quercus emoryi	Emory Oak			
•	Gleditsia triacanthos	Honey locust			
S	Cercis occidentalis	Western Redbud			
\bigotimes		Existing trees shrubs to be kept, species varies (locations approximate)			
SHRUBS & FORBS					
٨	Rhus trilobata	Three leaf sumac			
	Mahonia fremontii	Desert mahonia			
\otimes	Salvia greggii	Apache Plume			
*	Nolina microcarpa	Beargrass			
•	Perovskia atriplicifolia	Russian sage			
۲	Muhlenbergia capillaris 'Regal Mist'	Regal Mist Muhly			
	Cerastium tomentosum or Mahonia repens	Snow-in-Summer or creeping mahonia			

Current Burial Area Design

University of Arizona School of Landscape Architecture College of Architecture and Landscape Architecture

MASTER PLAN - PRIORITY AREAS

The second priority area identified is the entry drive and gate area. Again, the primary concern here is preventing erosion and soil wash down the entry drive and onto Iron Springs Rd. Also of concern, however, is bringing attention to the cemetery itself by creating a eye-catching entry.

The diagram on the top to the right shows suggestions for adding a new sign for the cemetery that would be similar to the existing signs at the Arizona Pioneers' Home. It also shows how drought tolerant shrubs, perennials and ground covers can be used to enhance the appearance of the entry without requiring a lot of water and maintenance. In general, this planting scheme relies on showier perennials to beautify the entrance. In addition, two western redbud trees flank the gates. These trees are also used to line portions of the entry drive, and mark the corners of the lower and middle roads. A ground cover of 3/4" - 11/2" rock mulch is recommended for this area to trap sediment and minimize maintenance. Erosion is controlled on the inside of the fence by creating shallow swales lined with buffalo grass. These swales will also provide the existing trees in this area additional water during storms.

The diagram on the lower right shows a similar design approach for a new ramada where the maintenance shed is currently located. Though not a priority, it demonstrates how a consistent design approach can be carried through all parts of the cemetery landscape, whether installed in the near future or at a later date. The ramada structure itself is simple, and could be constructed with a minimum of expense. As shown here, it incorporates a few benches for hosting small memorial ceremonies. It has a simple shed roof which could drain runoff into the adjacent planting beds.



Arizona Pioneers' Home Cemetery Prescott, Arizona



LANT LIST					
YMBOL		BOTANICAL NAME	COMMON NAME NOTES		
REES					
		Cercis occidentalis	Western Redbud		
HRUBS &	FORBS				
	\bigcirc	Robinia neomexicana	New Mexican locust		
	Jan Maria	Muhlenbergia rigens	Deergrass		
	And the second s	Euonymous fortunei 'colorata'	Winter creeper		
	G	Perovskia atriplicifolia	Russian sage		
	*	Pentstemon eatoni	Pentstemon		
	*	Iris germanica	Bearded iris		
	\bigcirc	Cerastium tomentosum	Snow-in-Summer		
		Hymenoxys acaulis	Angelita daisy		

Cemetery Entry Area Design

University of Arizona School of Landscape Architecture College of Architecture and Landscape Architecture

Ramada Area Design

PLANTINGS FOR SCREENING & SLOPE STABILIZATION

The plants on this page represent a variety of species that are native to the local high desert. Many of them already exist on the site. These plants are recommended for areas that will not receive any irrigation. The trees are excellent choices for screening the perimeter of the site, as well as for providing shade. The smaller shrubs, grasses and accent plants, such as Nolina and banana yucca, can be used in groupings to form an attractive understory to the trees, or on their own to help control erosion.









ORNAMENTAL PLANTINGS

The plants on these pages represent a range of perennials that could be used selectively to highlight special areas or features on the site, such as the entry. These have been chosen for both their color and form, and for their adaptability to the local soils and climate. Though many of these do best with a small amount of additional irrigation, they are largely drought tolerant. Many also either spread or self-sow, ensuring a profusion of blossoms for years to come.







REGAL MIST GRASS





PLANTING & REVEGETATION

The table at the right is a list of recommended plants for the Arizona Pioneers' Home Cemetery. All of the species have been recommended for use in the Prescott area by the Arizona Department of Water Resources, Prescott Active Management Area.

Category	Plant Name (Common)	Plant Name (Scientific)	Average Size	Sun Exposure	Water	Hardy?	Notes
Frees							
				C H I			Vibrant pink blooms in spring; does best with deep watering every 2
	Western Redbud	Cercis occidentalis	up to 20' tall	full-partial sun	average-low	yes	weeks during summer
	Arizona Cypress	Cupressus arizonica	Up to 40' tall, 20' wide	full sun	low	yes	Native
	Honey Locust	Gleditsia triacanthos	40' tall	full sun	average	yes	Drought resistant
	Alligator Juniper	Juniperus deppeana	20-40' tall	full sun	average	yes	Native
	Ponderosa Pine	Pinus ponderosa	Up to 100' tall	full sun	low	yes	Native
	Arizona White Oak	Quercus arizonica	Up to 60' tall	full	low	yes	Native
	Emory Oak	Quercus emoryi	Up to 50' tall	full sun	low	yes	Drought deciduous
Shrubs							
							Small white flowers in late spring; tolerates a wide range of conditions;
	Serviceberry	Amelanchier utahensis	Up to 15' x 15'	full sun	low	yes	very drought tolerant
	Manzanita	Arctostaphylos spp.	10'-12' high	sun/part shade	average-low	yes	
	Mountain mahogany	Cercocarpus montanus	3-15' tall	full sun	low	yes	Grows well on slopes
	Black Dalia	Dalia frutescens	4x4'	full sun	average	yes	Small purple flowers
	Trailing Dalia	Dalia greggii	5-10" groundcover	full sun	average	yes	Evergreen, small blue-purple flower
	Apache Plume	Fallugia paradoxa	3-6' tall	full sun	low	yes	White rose flower, pink silky seed heads,
	Gaura	Gaura lindheimeri	1-2" groundcover	full sun	average	yes	Small white flowers
							White flower sprays remain attractive for long period; plant with
	Mountain spray	Holodiscus dumosa	up to 10' x 10'	partial shade	low	yes	evergreens for screening
	Desert mahonia	Mahonia fremontii	4' x 4'	sun/part shade	low	yes	Evergreen, yellow flowers; tough; needs good drainage
							Evergreen, yellow flowers; plant under evergreen trees, especially
	Creeping mahonia	Mahonia repens	1' x 3' groundcover	partial shade	average	yes	pinyon pine and juniper; likes annual organic mulch cover
	Russian Sage	Perovskia atriplicifolia	4' tall, 3' wide	full sun	average-low	yes	
	Western sand cherry	Prunus pumila v. besseyi	5' x 5'	full sun	low	yes	Fragrant white flowers in spring followed by edible fruit; prune to shape
	Three Leaf Sumac	Rhus trilobata	3-6' tall, wide	full sun	low		Red/orange fall color
							Pink flowers, can take strong pruning, Suckers form clumps good for
	New Mexico locust	Robinia neomexicana	up to 25' tall,	full sun	average-low	yes	erosion control, nitrogen fixing
	Autumn Sage	Salvia greggii	up to 4' tall, 2' wide	full sun	average		Red to pink blooms, attracts hummingbirds
Forbs							
	Snow-in-Summer	Cerastium tomentosum	6"x3' groundcover	sun/part shade	low	yes	Forms thick mat; best with organic mulch mix when planted
							Bright yellow flowers spring through summer; best with some additional
	Coreopsis (tickseed)	Coreopsis grandiflora or C. tinctoria	1' x 3'	sun	average-low		irrigation; plant for showy effect with iris, rock rose, sage or other
							Tough native plant with white to yellow flowers depending on species;
	Buckwheat	Erigonum spp.	1' x 2-3'	sun	low	yes	plant as accent to native shrubs and for erosion control
	California Poppy	Eschscholzia californica		full sun			Annual, yellow to orange blossoms
							Rose Glory' has deep pink flowers; 'Single yellow' has pastel yellow
							flowers; glossy green foliage when not in bloom; nice groundcover mixed
	Rock rose (sun rose)	Helianthemum nummularium	6" x 18"				with snow-in-summer or with other perennials
	Angelita Daisy	Hymenoxys acaulis			sparingly		Yellow blooms
	Bearded Iris	Iris germanica	2.5'x1.5'	sun/part shade	low	yes	Colors vary, javelina resistant
	Blackfoot Daisy	Melampodium leucanthum				-	White daisy-like blooms with yellow eye
	Firecracker Penstemon	Penstemon eatoni	1 x1'	full sun	low	yes	Red flowers
	Germander	Teucrium chamaedrys 'prostratum'	1' x 2-3' groundcover	sun	low	yes	Lavender flowers in spring through summer; can be sheared in winter to
	Dessert Zinnia	Zinnia grandiflora	Up to 10" tall				Yellow blooms with orange eye
Grasses &	Accent Plants						
	Century Plant	Agave parryi	up to 18" wide	full sun	sparingly	very	rosettes
	Blue Grama	Bouteloua gracilis	Up to 18" tall	full sun	average to low	yes	needs well drained soil
	Winter Creeper	Evonymous fortunei 'colorata'	groundcover & fence cli		average	yes	Needs regular watering, good for this soil
	Regal Mist Muhly	Muhlenbergia capillaris 'Regal Mist'			- 0 -	, -	
	Deergrass	Muhlenbergia rigens	4'x4'	full sun			
	Mexican Feathergrass	Nassella tenuissima	12" x 30"	full sun			Great erosion control for sunny slopes
	Beargrass	Nolina microcarpa	3'x3'	full sun	sparingly	yes	
	Prickly Pear	Opuntia engelmannii	up to 4' tall, 10' wide	full sun	sparingly	yes	yellow-pink flower in later spring, pink cactus fruit
	Yucca bacata	Banana yucca	2-3' x 2-3'	full sun	low	yes	Showy cream blooms on stalk
		Bullana yucca	∠ J ∧ ∠⁻J	iun sun	10 W	yes	Showy creath blooms on stark

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EROSION CONTROL PLAN



EROSION CONTROL DIAGRAM

The erosion control methods listed on the right apply to the numbered areas in the diagram, and to all other areas on site with similar conditions. The priority areas identified in the Master Plan design section are also priority erosion control areas. They encompass the entry and lower drive area, and the lower slopes where current and future burial will continue.

As discussed in the master plan, the primary goal is to stabilize the topsoil in these areas. For the current / future burial areas, this should be done through a combination of hydroseeding with a buffalo grass seed mix and installing infiltration features along the edges of the road.

On the middle road, low rock or keystone retaining walls should be installed to create parking pullouts along the north side of the road. The pullouts should be lined with permeable pavers, as shown on the following page. Uphill sides of the retaining walls should be planted with ground covers such as creeping mahonia, snow-in-summer or kinnickinick. A combination vegetated swale - infiltration trench is proposed for the south side of the road. This would be lined with plants, as described in the master plan. The swale would terminate in shallow basins at either end of the road, where additional plantings would capture storm water and sediments. A similar combination of treatments is proposed for the lower road, with the exception of constructing retaining walls around the parking pullouts.

The second priority is the entry drive and gate area. As discussed in the master plan, similar types of detention infiltration features should be installed here, along with a variety of plants for erosion control and ornamental purposes. Areas along and outside of the fence should be covered with a combination of rock mulch and decorative boulders, with perennials and small shrubs to provide understory cover for the existing trees.

As time and funding permits, areas around the perimeter of the property and on the steeper slopes on the north side of the property (areas marked 3, 5 and 7 on this plan) should also have small swales and basins installed. Native trees, shrubs, accent plants such as nolina and yucca, and bunch grasses should be clustered along the perimeter to provide screening and stabilize these slopes. Area 6 on this plan should have small groupings of boulders placed in areas where no future burial will occur. These boulder groups can be planted with small shrubs or forbs, and given a cover of organic or rock mulch.

EROSION CONTROL METHODS

PLANTED SWALES, WATER CAPTURE BASINS, ROCK MULCH

- 2 DEFINE ROAD EDGE WITH PLANTING STRIPS; INCLUDE SWALES, CONCRETE CHANNELS AND DRAINS, INFILTRATION TRENCHES, WATER CAPTURE BASINS, ROCK MULCH
- 3 ORNAMENTAL PLANTINGS WITH ROCK MULCH, WATER CAPTURE BASINS
- 4 STABILIZE EDGE AREAS (~15' STRIPS) WITH GEOTEXTILE/MESH; HYDROSEED WITH LOW GROWING NATIVE GRASS (E.G., BUFFALO GRASS; TOP COVER OF ORGANIC MULCH
- 5 ENHANCED VEGETATIVE SCREEN WITH WATER CAPTURE FEATURES; ROCK MULCH AND BOULDERS IN PLACES

COMBINE BOULDERS WITH MULCH AND LIVE EROSION CONTROL TECHNIQUES IN CAREFULLY ARRANGED GROUPS

6

Hydroseed with buffalo grass; apply medium to coarse organic mulch at regular intervals (3-4 months)

> HATCH PATTERN INDICATES AREAS WHERE SHALLOW WATER AND SEDIMENT DETENTION FEATURES SHOULD BE INSTALLED. DETENTION BASINS AND SWALES SHOULD BE PLANTED WITH BUFFALO GRASS, PERENNIALS OR SMALL SHRUBS AND TREES. THEY MAY ALSO BE LINED WITH A VARIETY OF BOULDERS AND ROCK MULCH.



EXAMPLES OF STORMWATER & EROSION CONTROL FEATURES

The images on this page show how vegetated swales and porous paving are used to help manage storm water and control erosion on site. There are a wide variety of ways of implementing these strategies, using a range of plant, rock mulch and paving materials appropriate to just about any conditions. The key to successfully utilizing these approaches is to plan ahead for their construction, and install them consistently at all identified locations on the site.

At a minimum, these features require careful grading to maintain desired slopes for drainage, a nonwoven geotextile liner, coarse aggregate fill for the infiltration trench / basin, and uncompacted subgrade to minimize barriers to water percolation through the soil. This means that all earth work in the construction area must be carefully planned to minimize soil compaction. The diagram at the right shows a typical section of how a swale can be constructed. In addition, where plants will be used to line the infiltration features, make sure that only species that can tolerate periodic short-term flooding line the bottom of the swale or basin. Small check dams can be installed to further slow flooding. Coarse rock mulch mixed with variously sized boulders in places along the slopes of these features is also recommended to slow water flow, trap sediment and stabilize plants. Wherever boulders are used, they should be partially buried in the soil, rather than being set on top of the ground surface.

Although these simple features will provide sufficient storm water control for the cemetery, additional stabilization may be necessary in areas where no future burial is planned. The use of geotextile liners in combination with hydroseeding is recommended for areas around the margins of the property and on steeper slopes. This approach can also be used adjacent to roadways where no other features or plants will be installed.

There are also a great number of other erosion control techniques that could be employed. The following pages give an overview of a range of techniques that use a combination of surface grading, constructed slope stabilization features, such as gabions, and live plant materials to stabilize steep or severely eroded slopes. While most of these are not necessary or practical for the cemetery, several of them could, with minor modifications, be selectively used on portions of the property that are especially prone to erosion, or have other restrictions that require alternative erosion control methods, such as areas 6 & 7. Some of the methods could be customized for use on the cemetery site include: live staking or live fascines; brushlayering; and vegetated gabions and rock walls.



Bioswale Section















LIVE STAKING

DESCRIPTION:

Live staking involves the insertion and tamping of live, rootable vegetative cuttings into the ground. If correctly prepared and placed, the live stake will root and grow.

A system of stakes creates a living root mat that stabilizes the soil by reinforcing and binding soil particles together and by extracting excess soil moisture. Most willow species root rapidly and begin to dry out a slope soon after installation. This is an appropriate technique for repair of small earth slips and slumps that frequently are wet.

APPLICATION & EFFECTIVENESS

• A technique for relatively uncomplicated site conditions when construction time is limited and an inexpensive method is necessary.

• May be used for pegging down surface erosion control materials.

• Enhances conditions for natural invasion and the establishment of other plants from the surrounding plant community.

• Can be used to stabilize intervening area between other soil bioengineering techniques, such as live fascines.

CONSTRUCTION GUIDELINES

Live material sizes: The cuttings are usually 1/2 to $1 \ 1/2$ inches in diameter and 2 to 3 feet long, as shown

in figure. For final size determination, refer to the available cutting source.

Live material preparation:

• The materials must have side branches cleanly removed and the bark intact.

• The basal ends should be cut at an angle for easy insertion into the soil. The top should be cut square.

• Materials should be installed the same day that they are prepared.

INSTALLATION

• Tamp the live stake into the ground at right angles to the slope. The installation may be started at any point on the slope face.

• The live stakes should be installed 2 to 3 feet apart using triangular spacing. The density of the installation will range from 2 to 4 stakes per square yard.

• The buds should be oriented up.

• Four-fifths of the length of the live stake should be installed into the ground and soil firmly packed around it after installation.

• Do not split the stakes during installation. Stakes that split should be removed and replaced.

• An iron bar can be used to make a pilot hole in firm soil. Drive the stake into the ground with a dead blow hammer head filled with shot or sand).







LIVE FASCINES

DESCRIPTION:

Live fascines are long bundles of branch cuttings bound together into sausage-like structures. When cut from appropriate species and properly installed with live and dead stout stakes, they will root and immediately begin to stabilize slopes. They should be placed in shallow contour trenches on dry slopes and at an angle on wet slopes to reduce erosion and shallow face sliding. This system, installed by a trained crew, does not cause much site disturbance.

APPLICATION & EFFECTIVENESS

- An effective stabilization technique for slopes.
- Protects slopes from shallow slides (1 to 2 foot depth).
- Immediately reduces surface erosion or rilling.
- Suited to steep, rocky slopes, where digging is difficult.

• Capable of trapping and holding soil on the face of the slope, thus reducing a long slope into a series of shorter slopes.

• Enhances vegetative establishment by creating a microclimate conducive to plant growth.

CONSTRUCTION GUIDELINES

Live materials: Cuttings must be from species, such as young willows or shrub dogwoods, that root easily and have long, straight branches.

Live material sizes and preparation:

• Cuttings tied together to form live fascine bundles vary in length from 5 to 30 feet or longer, depending on site conditions and limitations in handling.

• The completed bundles should be 6 to 8 inches in diameter, with all of the growing tips oriented in the same direction. Stagger the cutting in the bundles so that tops are evenly distributed throughout the length of the uniformly sized live fascine.

• Live stakes should be 2 1/2 feet long in cut slopes and 3 feet long in fill slopes.

Inert materials: String used for bundling should be untreated twine. Dead stout stakes used to secure the live fascines should be 2 1/2-foot long, untreated, 2 by 4 lumber. Each length should be cut again diagonally across the 4-inch face to make two stakes from each length. Only new, sound, unused lumber should be used, and any stakes that shatter upon installation should be discarded.

INSTALLATION

• Prepare the live fascine bundles and live stakes immediately before installation.

• Beginning at the base of the slope, dig a trench on the contour just large enough to contain the live fascine. The trench will vary in width from 12 to 18 inches, depending

on the angle of the slope to be treated. The depth will be 6 to 8 inches, depending on the individual bundle's final size.

• Place the live fascine into the trench.

• Drive the dead stout stakes directly through the live fascine every 2 to 3 feet along its length. Extra stakes should be used at connections or bundle overlaps. Leave the top of the stakes flush with the installed bundle.

• Live stakes are generally installed on the downslope side of the bundle. Drive the live stakes below and against the bundle between the previously installed dead stout stakes. The live stakes should protrude 2 to 3 inches above the top of the live fascine. Place moist soil along the sides of the live fascine. The top of the fascine should be slightly visible when the installation is completed. Next, at intervals on contour or at an angle up the face of the bank, repeat the preceding steps to the top of the slope (table 18–3). When possible, place one or two rows over the top of the slope. Long straw or similar mulching material should be placed between rows on 2.5:1 or flatter slopes, while slopes steeper than 2.5:1 should have jute mesh or similar material placed in addition to the mulch.



BRUSHLAYER

DESCRIPTION:

Brushlayering is somewhat similar to live fascine systems because both involve the cutting and placement of live branch cuttings on slopes. The two techniques differ principally in the orientation of the branches and the depth to which they are placed in the slope. In brushlayering, the cuttings are oriented more or less perpendicular to the slope contour. The perpendicular orientation is more effective from the point of view of earth reinforcement and mass stability of the slope. Brushlayering consists of placing live branch cuttings in small benches excavated into the slope. The benches can range from 2 to 3 feet wide. These systems are recommended on slopes up to 2:1 in steepness and not to exceed 15 feet in vertical height. Brushlayer branches serve as tensile inclusions or reinforcing units. The portions of the brush that protrude from the slope face assist in retarding runoff and reducing surface erosion.

APPLICATION & EFFECTIVENESS

Brushlayers perform several immediate functions in erosion control, earth reinforcement, and mass stability of slopes:Breaking up the slope length into a series of shorter slopes

- separated by rows of brushlayer.
- Reinforcing the soil with the unrooted branch stems.
- Reinforcing the soil as roots develop, adding significant resistance to sliding or shear displacement.
- Providing slope stability and allowing vegetative cover to become established.
- Trapping debris on the slope.
- Aiding infiltration on dry sites.
- Drying excessively wet sites.
- •Adjusting the site's microclimate, thus aiding seed germination and natural regeneration.

• Redirecting and mitigating adverse slope seepage by acting as horizontal drains..

CONSTRUCTION GUIDELINES

Live material sizes—Branch cuttings should be 1/2 to 2 inches in diameter and long enough to reach the back of the bench. Side branches should remain intact for installation.

INSTALLATION

• Starting at the toe of the slope, benches should be excavated horizontally, on the contour, or angled slightly down the slope, if needed to aid drainage. The bench should be constructed 2 to 3 feet wide.

- The surface of the bench should be sloped so that the outside edge is higher than the inside.
- Live branch cuttings should be placed on the bench in a

crisscross or overlapping configuration.

- Branch growing tips should be aligned toward the outside of the bench.
- Backfill is placed on top of the branches and compacted to eliminate air spaces. The brush tips should extend slightly beyond the fill to filter sediment.
- Each lower bench is backfilled with the soil obtained from excavating the bench above.
- Long straw or similar mulching material with seeding should be placed between rows on 3:1 or flatter slopes, while slopes steeper than 3:1 should have jute mesh or similar material placed in addition to the mulch.
- The brushlayer rows should vary from 3 to 5 feet apart, depending upon the slope angle and stability.





BRANCHPACKING

DESCRIPTION:

Branchpacking consists of alternating layers of live branch cuttings and compacted backfill to repair small localized slumps and holes in slopes.

APPLICATION & EFFECTIVENESS

- Effective in earth reinforcement and mass stability of small earthen fill sites.
- Produces a filter barrier, reducing erosion and scouring conditions.
- Repairs holes in earthen embankments other than dams where water retention is a function.
- Provides immediate soil reinforcement.

CONSTRUCTION GUIDELINES

Live material: Live branch cuttings may range from 1/2 inch to 2 inches in diameter. They should be long enough to touch the undisturbed soil at the back of the trench and extend slightly from the rebuilt slope face.

Inert material: Wooden stakes should be 5 to 8 feet long and made from 3- to 4-inch diameter poles or 2 by 4 lumber, depending upon the depth of the particular slump or hole.

INSTALLATION

• Starting at the lowest point, drive the wooden stakes vertically 3 to 4 feet into the ground. Set them 1 to $1 \frac{1}{2}$ feet apart.

• A layer of living branches 4 to 6 inches thick is placed in the bottom of the hole, between the vertical stakes, and perpendicular to the slope face. They should be placed in a crisscross configuration with the growing tips generally oriented toward the slope face. Some of the basal ends of the branches should touch the back of the hole or slope.

• Subsequent layers of branches are installed with the basal ends lower than the growing tips of the branches.

• Each layer of branches must be followed by a layer of compacted soil to ensure soil contact with the branch cuttings.

• The final installation should match the existing slope. Branches should protrude only slightly from the filled face.

• The soil should be moist or moistened to insure that live branches do not dry out. The live branch cuttings serve as tensile inclusions for reinforcement once installed. As plant tops begin to grow, the branchpacking system becomes increasingly effective in retarding runoff and reducing surface erosion. Trapped sediment refills the localized slumps or holes, while roots spread throughout the backfill and surrounding earth to form a unified mass.



Branchpacking is not effective in slump areas greater than 4 feet deep or 5 feet wide.

LIVE CRIBWALL

DESCRIPTION:

A live cribwall consists of a hollow, box-like interlocking arrangement of untreated log or timber members. The structure is filled with suitable backfill material and layers of live branch cuttings which root inside the crib structure and extend into the slope. Once the live cuttings root and become established, the subsequent vegetation gradually takes over the structural functions of the wood members.

APPLICATION & EFFECTIVENESS

• This technique is appropriate at the base of a slope where a low wall may be required to stabilize the toe of the slope and reduce its steepness.

• Not designed for or intended to resist large, lateral earth stresses. It should be constructed to a maximum of 6 feet in overall height, including the excavation required for a stable foundation.

• Useful where space is limited and a more vertical structure is required.

• Provides immediate protection from erosion, while established vegetation provides long term stability.

• Should be tilted back or battered if the system is built on a smooth, evenly sloped surface.

• May also be constructed in a stair-step fashion, with each successive course of timbers set back 6 to 9 inches toward the slope face from the previously installed course.

CONSTRUCTION GUIDELINES

Live material sizes: Live branch cuttings should be 1/2 to 2 inches in diameter and long enough to reach the back of the wooden crib structure.

Inert materials: Logs or timbers should range from 4 to 6 inches in diameter or dimension. The lengths will vary with the size of the crib structure. Large nails or rebar are required to secure the logs or timbers together.

INSTALLATION

• Starting at the lowest point of the slope, excavate loose material 2 to 3 feet below the ground elevation until a stable foundation is reached.

• Excavate the back of the stable foundation (closest to the slope) slightly deeper than the front to add stability to the structure.

• Place the first course of logs or timbers at the front and back of the excavated foundation, approximately 4 to 5 feet apart and parallel to the slope contour.

• Place the next course of logs or timbers at right angles (perpendicular to the slope) on top of the previous course to overhang the front and back of the previous course by 3

to 6 inches.

• Each course of the live cribwall is placed in the same manner and nailed to the preceding course with nails or reinforcement bars.

• When the cribwall structure reaches the existing ground elevation, place live branch cuttings on the backfill perpendicular to the slope; then cover the cuttings with backfill and compact.

• Live branch cuttings should be placed at each course to the top of the cribwall structure with growing tips oriented toward the slope face. Follow each layer of branches with a layer of compacted soil to ensure soil contact with the live branch cuttings. Some of the basal ends of the live branch cuttings should reach to undisturbed soil at the back of the cribwall with growing tips protruding sightly beyond the front of the cribwall.





LIVE GULLY

DESCRIPTION:

A live gully repair utilizes alternating layers of live branch cuttings and compacted soil to repair small rills and gullies. Similar to branchpacking, this method is more appropriate for the repair of rills and gullies.

APPLICATION & EFFECTIVENESS

• The installed branches offer immediate reinforcement to the compacted soil and reduce the velocity of concentrated flow of water.

• Provides a filter barrier that reduces rill and gully erosion.

• Limited to rills or gullies which are a maximum of 2 feet wide, 1 foot deep, and 15 feet long.

CONSTRUCTION GUIDELINES

Live material sizes: Live branch cuttings may range from 1/2 inch to 2 inches in diameter. They should be long enough to touch the undisturbed soil at the back of the rill or gully and extend slightly from the rebuilt slope face. Inert materials: Fill soil is compacted in alternate layers with live branch cuttings.

INSTALLATION

• Starting at the lowest point of the slope, place a 3- to 4-inch layer of branches at lowest end of the rill or gully and perpendicular to the slope.

• Cover with a 6- to 8-inch layer of fill soil.

• Install the live branches in a crisscross fashion. Orient the growing tips toward the slope face with basal ends lower than the growing tips.

• Follow each layer of branches with a layer of compacted soil to ensure soil contact with the live branch cuttings.



VEGETATED ROCK GABIONS

DESCRIPTION:

Vegetated gabions begin as rectangular containers fabricated from a triple twisted, hexagonal mesh of heavily galvanized steel wire. Empty gabions are placed in position, wired to adjoining gabions, filled with stones and then folded shut and wired at the ends and sides. Live branches are placed on each consecutive layer between the rock filled baskets. These will take root inside the gabion baskets and in the soil behind the structures. In time the roots consolidate the structure and bind it to the slope.

APPLICATION & EFFECTIVENESS

• This technique is appropriate at the base of a slope where a low wall may be required to stabilize the toe of the slope and reduce its steepness.

• Not designed for or intended to resist large, lateral earth stresses. It should be constructed to a maximum of 5 feet in overall height, including the excavation required for a stable foundation.

• Useful where space is limited and a more vertical structure is required.

CONSTRUCTION GUIDELINES

Live material sizes: Branches should range from 1/2 to 1 inch in diameter and must be long enough to reach beyond the back of the rock basket structure into the backfill. Inert materials: Inert material requirements include wire gabion baskets and rocks to fill the baskets.

INSTALLATION

• Starting at the lowest point of the slope, excavate loose material 2 to 3 feet below the ground elevation until a stable foundation is reached.

• Excavate the back of the stable foundation (closest to the slope) slightly deeper than the front to add stability to the structure. This will provide additional stability to the structure and ensure that the living branches root well.

• Place the fabricated wire baskets in the bottom of the excavation and fill with rock.

• Place backfill between and behind the wire baskets.

• Place live branch cuttings on the wire baskets perpendicular to the slope with the growing tips oriented away from the slope and extending slightly beyond the gabions. The live cuttings must extend beyond the backs of the wire baskets into the fill material. Place soil over the cuttings and compact it.

• Repeat the construction sequence until the structure reaches the required height.





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VEGETATED ROCK WALL

DESCRIPTION:

A vegetated rock wall is a combination of rock and live branch cuttings used to stabilize and protect the toe of steep slopes. Vegetated rock walls differ from conventional retaining structures in that they are placed against relatively undisturbed earth and are not intended to resist large lateral earth pressures.

APPLICATION & EFFECTIVENESS

• This system is appropriate at the base of a slope where a low wall may be required to stabilize the toe of the slope and reduce its steepness.

• Useful where space is limited and natural rock is available.

CONSTRUCTION GUIDELINES

Live material sizes: Live cuttings should have a diameter of 1/2 to 1 inch and be long enough to reach beyond the rock structure into the fill or undisturbed soil behind.

Inert materials: Inert materials consist of rocks and fill material for the wall construction. Rock used should normally range from 8 to 24 inches in diameter. Larger boulders should be used for the base.

INSTALLATION

• Starting at the lowest point of the slope, remove loose soil until a stable base is reached. This usually occurs 2 to 3 feet below ground elevation. Excavate the back of the stable foundation (closest to the slope) slightly deeper than the front to add stability to the structure.

• Excavate the minimum amount from the existing slope to provide a suitable recess for the wall.

• Provide a well-drained base in locations subject to deep frost penetration.

• Place rocks with at least a three-point bearing on the foundation material or underlying rock course. They should also be placed so that their center of gravity is as low as possible, with their long axis slanting inward toward the slope if possible.

• When a rock wall is constructed adjacent to an impervious surface, place a drainage system at the back of the foundation and outside toe of the wall to provide an appropriate drainage outlet.

• Overall height of the rock wall, including the footing, should not exceed 5 feet.

• A wall can be constructed with a sloping bench behind it to provide a base on which live branch cuttings can be placed during construction. Live branch cuttings should also be tamped or placed into the openings of the rock wall during or after construction. The butt ends of the branches should extend into the backfill or undisturbed soil behind the wall.

• The live branch cuttings should be oriented perpendicular to the slope contour with growing tips protruding slightly from the finished rock wall face.



JOINT PLANTING

DESCRIPTION:

Joint planting or vegetated riprap involves tamping live cuttings of rootable plant material into soil between the joints or open spaces in rocks that have previously been placed on a slope. Alternatively, the cuttings can be tamped into place at the same time that rock is being placed on the slope face.

APPLICATION & EFFECTIVENESS

• Used where rock riprap is required.

• Roots improve drainage by removing soil moisture. Over time, they create a living root mat in the soil base upon which the rock has been placed. The root systems of this mat help to bind or reinforce the soil and to prevent washout of fines between and below the rock units.

CONSTRUCTION GUIDELINES

Live material sizes: The cuttings must have side branches removed and bark intact. They should range in diameter from 1/2 inch to $1 \ 1/2$ inches and be sufficiently long to extend into soil below the rock surface.

INSTALLATION

• Tamp live branch cuttings into the openings of the rock during or after construction. The butt ends of the branches should extend into the backfill or undisturbed soil behind the riprap.

• Orient the live branch cuttings perpendicular to the slope with growing tips protruding slightly from the finished face of the rock.









VEGETATED GEOTEXTILE

DESCRIPTION:

A vegetated geogrid or geotextile consists of alternating layers of live branch cuttings and compacted soil with geotextiles (natural or synthetic) wrapped around each soil lift. The system is sometimes also referred to as fabric encapsulated soil or "live soft gabion." The geogrid traps sediment and reinforces and rebuilds the stream bank.

APPLICATION & EFFECTIVENESS

• Vegetated geotextiles are useful for rebuilding very steep eroded stream banks or configuring new banks in stream realignment projects with slopes too steep for normal brushlayering. They offer a higher initial tolerance of velocity than traditional brushlayering techniques. Once the live cuttings become established, their root systems penetrate the grids and the entire system becomes a cohesive mass.

INSTALLATION

• Excavate lower edge of slope break and bench back cut. Compact the soil layer. Note: Structural integrity is dependent on compacted soil layers. Even with mechanized firming, soils support live cuttings.

- Lay first layer of geotextile down into the bench.
- Fill lowest lift with gravel, fold back, and stake securely.

• Fill subsequent layers with soil and layers of live cut branches and alternate with lifts. Each layer must be compacted.

• The structure can be built with a vertical face or stairstepped and sloped back into the hillside.





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DESIGN GUIDELINES & MAINTENANCE PRACTICES




DESIGN GUIDELINES HISTORIC CEMETERY BEST MANAGEMENT PRACTICES

This section of the Master Plan will address the varying needs of the two distinct sections of the Arizona Pioneers' Home Cemeteries: 1) the Historic Section located at the Northern section of the site and 2) the Modern section which includes the lower Southern areas of the site, where burials have occurred more recently or have yet to occur.

Goals:

- To set standards for future cemetery use and have a unified vision of what is/is not appropriate for the site
- To establish and maintain a distinct identity/ character for the grounds that is mindful of the historic integrity of certain sections.

Historic Preservation

To maintain the integrity of the earlier burial sites, the following general guidelines should be observed:

- Do no harm to the existing historic features.
- All actions should respect the original fabric of the cemetery.
- Use the gentlest and least invasive means possible for repairs or changes to historic areas.
- Attempt to do that which can be reversed.
- Quick or easy fixes may not always be a reasonable choice.
- When in doubt, consult a professional.¹



While it is important to stabilize the historic areas of the Pioneers' Home Cemetery from erosion problems, visitor foot traffic, pest incursions, and general disrepair like broken headstones, such work should only be undertaken after careful planning and thought. While "false history" (for example, weathering a material to make it appear older) should not be permitted, it is imperative that the older sections retain their primary character. Use of inappropriate techniques, materials, or design can have a substantial negative impact on these valuable sites.

Burial Areas

Preservation of burial areas should consider the following elements:

- Grave markers (to be covered subsequently in greater detail);
- Grave caps; and
- Fencing/walls.

Grave Caps

Existing grave caps should be left in place and repaired rather than replaced, unless the cap has deteriorated to a stage where it cannot be repaired or is a safety hazard. Existing caps may be repaired only with the same (or like) materials as the original in a manner consistent with the historic integrity of the grave site. Any necessary digging should be done by hand, not by excavation equipment. A shallow slumping of the grave fill may be appropriate to leave, unless it is creating ponding near the grave marker or other structure that might be damaged by standing water. In this instance, or if there is more pronounced slumping, it should be filled in with spoils (soil excavated for graves) from elsewhere within the cemetery; foreign soil should not be used. When grave markers are situated perpendicular to steep slopes, they may act as retention structures, causing a build-up of soil on the upslope side while eroding the grave cap side. This problem should be corrected on an annual basis by removing the soil buildup and placing in it in the depressed area.

Fencing/Walls

Ornamental fencing and gates are common features of historic cemeteries, and remaining fencing in historic burial areas should be restored and/or maintained. The most typical materials are wrought iron, cast iron, and zinc (or white bronze, a material that was more popular for 19th century monuments). Cast iron has a high carbon content, making it hard and brittle when cool, but good for molding when hot. Complex, repetitive elements with a grainy texture are likely to be cast iron; pieces may also have mold lines and/or be screwed together. Wrought iron has a lower carbon content, which renders it softer and more malleable. This metal was worked by hand, yielding unique pieces that may show hammer marks. Both types of iron are susceptible to corrosion, though wrought iron is more at risk. Damage such as breakage, structural failure, and loss of masonry footing are also concerns. Corrosion occurs when there is a combination of oxygen and moisture. Though this is less of a concern in Arizona's dry climate, ironworks should be monitored for cracks in the material or ponding at the base. Any





corrosion must be stabilized and removed before a crack can be sealed with clear silicone sealant. To stabilize, scrape away corrosion gently by hand, then apply a rust converter; Rust-Oleum Rust Reformer is recommended. The fencing should then be painted with an alkyd- (not latex) based topcoat. If there is no historic evidence of an original color, flat black is appropriate. Repairs should be made in a manner consistent with the original construction. Cast iron components should be replaced if there is significant deterioration around attachment points or if a section has been broken off, though care must be taken not to use a dissimilar metal that may cause a corrosive reaction (galvanic corrosion).

Footings should be checked to insure that the stone or concrete is dry and not causing corrosion to the fencing. If the footing is damaged, missing, or being impacted by erosion, it should be stabilized immediately to prevent damage to the fencing. Damaged or missing footings should be repaired or replaced using like kind materials. Where soil has eroded from around an intact footing it should be further shored up with a like kind material (placing another stone under the stone, for example), and the missing soil replaced. However, keep in mind that the erosion problem will need to be addressed at its source. Properly maintained footings will help prevent possible theft of fencing sections. Any sections of modern chain link fencing that are visible

1 Kingg, Greg, Susan Kosky, Kathleen Glynn, and Gladys Saborio. <u>Michigan Historic Cemeteries Preservation Guide</u>. Charter Township of Canton: 2004. p. 61.



from historic areas should be considered for replacement with a more historically appropriate fencing type such as metal picket.

The Arizona Pioneers' Home Cemetery contains historic dry laid low masonry walls. These walls should be preserved as they are unless erosion becomes a problem. In the event that soil build-up behind the wall causes it to bow outwards, excess soil should be removed from behind the wall and replaced with gravel backfill. The walls should not be pointed with mortar as that was not their original construction. Weeds should be removed on an annual or biannual basis, by hand or with a low-toxicity herbicide such as Round-Up (glyphosate), Oust (sulfometuron methyl) or Tordon (picloram). These herbicides are commonly used in forestry and silviculture, and have been extensively tested for their toxic and contaminant potential to both humans and animals. For more information, see: <u>http://www.aces.</u> edu/pubs/docs/A/ANR-0846/

Cleaning grave markers

The first question should always be, "does this stone truly need cleaning?" Often people mistake the patina of age for "dirt." They want marble stones, for example, to be as white as when originally purchased – and this is a tragic mistake. Not only does such aggressive cleaning cause irreparable damage, but it destroys the stone's patina – and history – making it look like the stone was placed in the cemetery only yesterday. Once a program is started, it may lead to a need for more frequent cleaning, i.e., every few months. Every cleaning, no matter how gentle, has the potential to cause additional damage to the stone. Consequently, it may be best to leave grave markers in their current condition.

There are times when biological growth may be causing deterioration of the stone. In such circumstances it may become necessary to clean the stone. Many professional conservators will also clean the stone in order to get closer to the original stone color for infill matching.

Algae, lichen and fungi can deteriorate gravestones because they trap moisture on, and under the surface of, the stone. They also secrete acids that can dissolve limestone, marble, sandstone, concrete, and mortar. And they may insert their "roots" into the pores of the stone. These growths will swell and shrink in response to moisture, leading to cracking and spalling of the stone. Plant life -- such as ivy, ferns, and moss, may be hazardous to the gravestone because roots will penetrate the stone, and the plants can trap moisture.

It is important to identify the material of a grave marker prior to cleaning or undertaking repairs as there are different techniques for different materials. In historic areas, it is not appropriate to attempt to return a headstone to its original appearance. This means it should not be harshly cleaned, and inscriptions should not be recarved. A "patina of age" is part of the history and beauty of these markers; therefore, only the removal of harmful elements should be attempted. These include organics like lichens and mosses, efflorescence (salt buildup), and carbon or soot. Excess soil on the headstone may also need to be washed off.

Removal of Organic Materials

On smooth, stable surfaces, algae, lichen, and fungus may sometimes be easily brushed or scraped off before washing (always use scrapers that are softer than the stone, such as wood popsicle sticks or bamboo skewers). Most surfaces, however, require wetting the growth before gently brushing, prying, or scraping them off the stone. Plants should be gently pulled out of cracks or clipped, and remaining soil or debris should be brushed away from the stone. The plant's root system should be removed with the soil and debris. If there is a mass of plant life, don't forcefully pull it from the stone -- the stone will almost certainly be damaged. Carefully clip or pull away each section, to prevent pulling away any loose or weakened fragments of stone.

Basic Cleaning

- 1. Remove any loose debris or plant life (see above)
- 2. Thoroughly wet the stone with a hose and running water. The water will wash away some of the dirt or biological material, and also is essential to prevent the stone from absorbing the detergent used in the next step in cleaning.
- 3. Gently scrub the stone with very light pressure in a circular motion using a soft-bristle brush to dislodge soil/biological growth from the stone. Work from the







bottom of the stone up toward the top -- this prevents staining and streaking as clean water drains downward. Do not use a dry brush; a dry brush can damage the gravestone by removing the upper layers of the stone, causing it to deteriorate faster or by opening small holes or pores for future biological growth. Constantly dip the brush in a bucket of water, or better, allow a water hose to run on the stone as it is brushed.

- 4. Rinse the brush frequently and keep brushes clean.
- 5. Use clean water. Change water frequently or use a running hose.
- 6. Rinse the stone thoroughly with water when finished.

Cleaning with Vulpex Soap

- 1. Thoroughly wet the stone with running water from a hose. Vulpex Liquid Soap is potassium methyl cyclohexyl oleate and has a pH of 10.5 to 11.5. Diluted with water it is considered noncombustible. There are no specific hazards in handling either the concentrate or diluted solutions. Since Vulpex is a most efficient degreaser, protective gloves should be used. Odors or fumes from the water solutions of Vulpex are not known to be harmful, but adequate ventilation should be used. Avoid splashing the liquid in your eyes. Ask the supplier for a Material Safety Data Sheet (MSDS) for additional safety information.
- 2. Create a cleaning solution of water and Vulpex (1 ounce Vulpex to 1 gallon of water, yielding a 1% solution) in a clean bucket. Do not make more than a gallon at a time.



- 3. Dip a soft-bristle brush in the soap solution and scrub the stone with very light pressure in a circular motion. The less soap used and the shorter its contact time with the stone, the better. If soap is allowed to remain in contact with the stone, there is more of a chance of it being deeply absorbed and perhaps causing future chemical deterioration of the stone.
- 4. Rinse your brush frequently using clean water, then dip it back into the soap bucket to pick up more Vulpex solution. Don't abrade the gravestone by dragging dirt, sand, particles of broken stone, twigs, etc. across the surface you are supposed to be protecting.
- If biological materials continue to cling to the stone, use a wooded popsicle stick, or bamboo skewer to gently pry or scrape the material away from the surface if the stone is in stable condition. If the material continues to cling, use more water. Eventually water will soften all biological materials enough to allow them to be safely removed.
- If at any time the stone you are working on is unstable

 it flakes, spalls, or sugars (produces lots of grit) stop cleaning immediately! This applies to all forms of
 cleaning and repair work.
- 7. When the stone is clean, rinse it thoroughly with water. This means allowing water to run over the stone for at least an additional five minutes -- about the time it will take to locate the next stone to be cleaned and get set up. A significant problem with detergents such as Vulpex is that if they aren't thoroughly rinsed out, they will attract soil and promote biologicals -- just the opposite of what you are trying to accomplish.

8. Never undertake cleaning is freezing temperatures are anticipated within the next 24 hours.

Cleaning with D/2 Architectural Antimicrobial

- Thoroughly wet the stone with running water from a hose. D/2 Architectural Antimicrobial is a proprietary combination of octyl dimethyl ammonium chloride, oioctyl dimethyl ammonium chloride, oidecyl dimethyl ammonium chloride, and alkyl dimethyl benzyl ammonium chloride with surfactants, wetting agents, and buffers. It has a pH of 9.5. It is noncombustible. There are no specific hazards in handling either the concentrate or diluted solutions. Avoid splashing the liquid in your eyes. Ask the supplier for a Material Safety Data Sheet (MSDS) for additional safety information.
- Heavy growth should be cleaned with undiluted D/2. For lighter deposits D/2 can be diluted with potable water from 1:1 to 1:4 parts water by volume.
- 3. The D/2 can be applied to the stone using a brush, roller, or pump sprayer. Scrub the surface thoroughly with a soft-bristle brush and allow the D/2 to remain on the surface of the stone for 1 to 2 minutes (up to 10 minutes for optimal action when there is heavy growth). Then apply additional D/2 to maintain a wet surface. Lightly mist with water and continue light scrubbing. Complete cleaning may require multiple applications.
- 4. When the stone is clean, rinse it thoroughly with water.

What NEVER to do to Stone

There are some "cleaning" approaches that should NEVER be used on cemetery markers.

- Use of bleach Sodium hypochlorite (common bleach) contains salts that damage stone. Stone "cleaned" with bleach, upon careful inspection, reveals erosion and yellowing.
- 2. Use of acid cleaning Acids on marble and limestone dissolve the stone, leaving an inappropriate glossy and crystallized looking surface. This damage cannot be undone and the use of acids is also dangerous to you and surrounding vegetation.
- 3. Use of sand blasting This approach (even if "soft" materials like glass spheres are used) is very harsh and will dramatically abrade the stone surface. This has the potential to actually accelerate further deterioration of the stone. Once done, there is no way to undo the extreme damage caused by sandblasting. The patina, or historical beauty of the stone, is entirely destroyed.
- 4. Use of high pressure water Water pressure over 40-50 psi has the potential to significantly damage any stone that isn't sound, increasing spalling and accelerating sugaring.
- 5. Recarving inscriptions While not actually a cleaning technique, this is sometimes done to "improve" the readability of faint inscriptions. But it does irreparable damage to historic stones, destroying their original artistry and beauty -- and destroying the historic significance of the stone itself. There are other approaches if a family wants to ensure that the grave







continues to be clearly marked, such as setting a new stone horizontal on the ground

Sources for Products:

Vulpex : Conservation Resources International, 8000-H Forbes Place, Springfield, VA 22151 www.conservationresources.com 800-634-6932

University Products, 517 Main Street – PO Box 101, Holyoke, MA 01041 www.universityproducts.com 800-628-1912

D/2 Architectural Antimicrobial: Cathedral Stone Products, Inc., 7266 Park Circle Drive, Hanover, MD 21076 www.jahnmortars.com 800-684-0901

For more information and guidelines on cleaning grave markers, see: <u>http://www.michigan.gov/documents/hal_mhc_shpo_</u> <u>Cemetery_Guide_105082_7.pdf</u>



Repairing grave markers

The conservation and repair of headstones and monuments can be a complex process that in many instances should only be performed by professionals. These include: resetting monuments or large headstones, repairing snapped headstones, and replacing missing stone fragments. In these cases, professional conservators can prevent damage to heavy markers, and ensure proper repair to the stone itself. This is appropriate for areas of the cemetery that present the greatest historic significance.

For all other areas, there are several repairs that can be done by cemetery maintenance staff without professional assistance, though these must be done with patience and care. There are a few general guidelines for any repairs to historic grave markers:

- The repair must be less strong than the original.
- Additional damage to the stone could result if the repair material is stronger than the original stone. If a new break occurs, the intent is to avoid any more damage to the original stone; i.e., the repair should fail, not the stone.
- The repair should be reversible.
- A repair should be able to be disassembled without damage to the stone. This is desirable because improved repair procedures may become available in the future.
- The repair should respect the original material of the marker.
- The repair methods and materials are compatible with those of the original marker, and minimize the possibility of further damage or discoloration to the stone.

- The repair needs to be as historically accurate as is reasonable and possible.
- The repair must not inhibit the natural permeability and breathe-ability of the stone. Avoid adhesives, coatings, sealers, or other repair materials that may retain moisture or affect breathe-ability, which can result in secondary damage.
- Before attempting to repair headstones in a historic cemetery, inspect stones carefully to assure that they have not developed previously unforeseen cracks, spalling, or other weaknesses that would affect the repair.
- Familiarity with the types of stone, with characteristics of mortars and epoxies, and with other equipment is required prior to working on an actual historic headstone.¹

Common repairs that may not need professional intervention to correct include fixing tilted or fallen stones set in earth, and resetting a stone in a concrete base. If possible, it is recommended that a marker be photographed on either side to document the condition before starting a repair.

Resetting Tilted Markers

Only gravestones that are severely tilted should be reset since there is always the possibility that resetting may cause other damage to the stone. Assume that all stones are fragile and have some form of internal cracking or damage

Straightening a tilted marker / resetting a marker set in earth

Hand dig around the base of the stone from the back (the side away from the grave), being careful not to scrape it with metal tools. Excavate to the bottom of the stone and then straighten it to vertical. Back fill the hole 1/3 with heavy aggregate like a gravel mix, or alternatively, lay dry flat stones or brick in the bottom of the hole and top with bagged clay. Placing a layer of landscape fabric over these stabilization courses can prevent topsoil from migrating downward. Fill in the rest of the hole with native topsoil and tamp lightly.

For a completely fallen stone, first prepare a hole. To determine the depth, measure the stone. Typically, about $\frac{1}{4}$ to 1/3 of the stone should be buried; none of the inscription should be obscured. Carefully excavate under the stone and then run nylon lifting straps underneath to lift it. Place it in the hole, making sure it is both vertical and level. Depending on the weight of the stone and the softness of the earth, it may be advisable to create a firm base for the stone by placing a layer of bricks or gravel in the bottom of the hole, covered by an inch of sand. Finish resetting as per tilted headstones, and wait for the marker to have settled before attempting any cleaning.

Resetting a stone in a concrete base

Tablet markers may be set on either a slot-style base (similar to tongue-in-groove in carpentry), or flat-top bases in which part of the base stone is left exposed above ground. To reattach a tablet to a flat-top base, it is advisable to use mortar or epoxy. To repair a slot-style tablet, excavate a hole about 8 inches deep, 6-10 inches longer than the







width of the tablet and 6-10 inches wider than the thickness. Prepare a wood form to create a slot in the concrete (the slot in the concrete will be $\frac{1}{2}$ inch larger than the stone and needs to be long enough to extend out of the hole). Pour several inches of gray Portland cement into the hole, set in your prepared slot form, and continue filling the hole to within a few inches of ground level. Make sure the form is vertical and allow the concrete to set just until it will holds its shape; then remove the form and allow to finish setting. To reset the stone, make a mortar mix of 1:3 hydraulic lime (NHL with a rating of 2 recommended) and sand. Spread the mortar mix in the base and on the sides of the slot and set the marker.² If a slab has been broken and cannot be reset as described, it can alternatively be set upright in a prepared socket in a poured concrete base or reset near horizontal on a below-grade concrete slab. In these cases, a fiberglass reinforced concrete mix is advisable. In both instances, the cement should be prepared with a void that is filled with mortar mix into which the stone is placed. Note: never set a stone directly into cement! Because these methods alter the historical placement of the stone, they should only be used as a last resort if a marker it too damaged to be reset as it was originally.

Leveling a Monument

Some monuments require little more than releveling. The first decision must be whether the task can be handled in a

1 Kingg, Greg, Susan Kosky, Kathleen Glynn, and Gladys Saborio. <u>Michigan Historic Cemeteries Preservation Guide</u>. Charter Township of Canton: 2004.

2 Chicora Foundation website. http://chicora.org/



manner that will be safe for both you and the monument. If in doubt, do nothing and hire a stone conservator. If, however, the monument is small and appropriate tools are available, follow these guidelines.

- While a level is often a vital tool, it is also important to realize that a monument is generally considered level when it appears level with respect to the surrounding terrain.
- Steel pry bars should only be used when the monument will not be damaged. Otherwise, it will be necessary to use a hoist and straps -- and this requires more equipment, skill, and care.
- If the monument has no foundation it can generally be leveled using screenings (crusher fines), small pea gravel, or similar material. The key is to add material in shallow fills and ensure that the screenings are tamped down between lifts. If there is a previous concrete foundation and it, too, has slumped into the grave, then it will generally be necessary to remove the concrete and pour a new foundation. This is more complex and you probably should consult a conservator.

Resetting Badly Broken Markers

Some headstones are so damaged that resetting in a tab as described above is simply not possible. One alternative is to reset them near horizontal on (but NOT in) a concrete slab. There are several techniques for this and the particular design will need to suit the circumstances. Here is one example.

- Begin by laying out the various fragments and determining the overall size of a support necessary. For example, a support canted about 6" over a length of 3', with a height of 6" at the base and about 12" at the head.
- 2. Create a form over a below-grade excavation. Because of the size of the concrete support being created in the above example, rebar would be used to help reinforce the concrete pour. Fiberglass reinforced concrete mix could be used as well.
- After the concrete is poured and set, the form is removed and the ledger is arranged on the concrete, set in a mortar mix. An appropriate mortar is a 1:3 mix of natural hydraulic lime (NHL) and sand. A NHL with a rating of 2 - one that is weakly hydraulic - is recommended. This setting mortar is softer than the stone and any failure is likely to occur in the mortar, preventing the stone from being broken.
- 4. After setting, the stone is infilled using an appropriate conservation mortar, such as Jahn or U.S. Heritage. For this you will need a stone conservator.

A lower, less canted basal support could also be used. In such a reset, the stone is said to be "floated" on a lime-based mortar bed. A 4-inch concrete foundation, the outline of the stone, is poured and allowed to cure. The surface of this slab is canted - generally about 1" for every 1'. It is important to cant the bed to ensure that there is positive drainage and water (that is typically acidic) does not collect on the face of the monument. The stone fragments are then reassembled snuggly on a bed of lime-based mortar. Cracks and losses are infilled using an appropriate conservation mortar.

Landscape Features Topography, Slope and Erosion

The shape of the land is an important aspect of any historical cemetery, and this is particularly true of the Arizona Pioneers' Home Cemetery where the hillside is part of what creates a unique character. Erosion control is clearly an urgent need on this site, and methods of achieving this goal are explained in detail elsewhere in report. There are several types of storm water control needed at The Arizona Pioneers' Home Cemetery. These include erosion mitigation methods along roadways, as well as slope stabilization on hillsides, and small water detention features. However, standing water should not be allowed on site as it can damage features of the cemetery such as grave markers and may also pose a health issue.

Pathways/roadways

Although not an issue at the Pioneers' home cemetery, it is good to keep in mind that the preservation of paths and roads in historic cemeteries can present a dilemma. On the one hand, their original alignment shows how visitors historically experienced moving through the cemetery. On the other hand, modern demands may require some changes to these circulation routes. When changes must be made, historic appropriateness should be kept in mind along with cost and maintenance concerns. Dirt, gravel, cinder, stone, stone dust, brick, concrete, and macadam







have all been used historically as path and roadway finishes.

<u>Plantings</u>

If there are significant historical plantings in healthy condition, it is generally recommended that they be propagated so that the same species can continue to be grown on the site. This may be through cuttings or gathering and germinating seeds. While the Pioneers' Home Cemetery may not have the time and resources for this work, it is possible that a local horticulture organization such as the Arizona Native Plant Society, Northern Region might be willing to do so.

Impacts from new projects

The potential impact from new projects on the historic sections of the cemetery should be carefully considered before work is started. Of chief concern are:

- Will the changes cause any further water flow over/ erosion to the historic area?
- Will the changes alter or increase patterns of foot traffic in such a way as to cause damage to the historic sections?
- Will the changes have any bearing on the character of the historic sections?

The last pages of this section of the document show images of materials and furnishings that are appropriate for the historic and contemporary character of the Pioneers' Home Cemetery. We strongly recommend that only similar types of materials be used in all new projects on the site.



MODERN CEMETERY BEST MANAGEMENT PRACTICES

Though the Arizona Pioneers' Home Cemetery was first established in an earlier time, it continues to be used today both as an active burial ground and a place for visitors. While it is important to preserve the historical aspects of the cemetery as outlined above, certain improvements will need to be made in the future. In many cases, such improvements will also serve to protect the historic areas.

Appropriate Materials

The Arizona Pioneers' Home should establish very specific guidelines for any future development of the modern sections of the cemetery. The following materials are recommended for their durability, ease of maintenance, aesthetic value and low environmental impact.

- Hardscape
 - Asphalt
 - Permeable Pavers
 - Stabilized soil or decomposed granite
 - Concrete
 - Flagstone
- Headstones & Gravemarkers
 - Marble
 - Granite
 - Cast iron, wrought iron, or steel
 - Concrete
 - Built Elements & Site Furnishings
 - Cut stone, river rock
 - Brick
 - Lumber (ramada, benches, etc.)
 - Iron, cor-ten steel
 - Concrete

ADA Access

While the moderately steep slopes found on the cemetery may limit access to certain areas for some visitors, as much of the site as possible should be made handicap accessible. The Americans with Disabilities Act (ADA) provides specific guidelines for all aspects of design, including curb ramps, parking space widths, ground materials, and benches. The full set of guidelines is available online at: <u>http://www.access-board.gov/adaag/ html/adaag.html</u>. If new walkways are constructed, they should have overall slopes of about 5% (ADA maximum = 8%), although steeper grades are acceptable for short distances.

Parking

As the number of interments increases, so may the demand for parking within the cemetery. The master plan in this document increases the number of parking spaces over that currently available. It is not recommended that more parking be added at a later time due to space and slope constraints. However, if additional parking is required at some future time, it is recommended that it be located in the verge of existing roadways, using a permeable paving of some type.

Seating

Seating is a modern addition to the cemetery that can be considered necessary (see ADA Guidelines). Choice of materials, design, and placement of the seating benches should be done with sensitivity to the historic aspects of



the site. The master plan recommends benches be placed in three main areas in the near future:

- Along the lower roadway, on the north side of the road;
- Along the middle roadway, placed on both the north and south sides of the road; and
- Near the Simmons Section or new viewpoint spot where the spoils stockpile is currently located.

Seating in these three areas would best serve the needs of those who currently visit the cemetery. Benches both with and without backs are recommended. The advantage of benches with backs is that they provide better support for those who need it most. Backless benches are useful in places where visitors may want to have a view in either direction, and so have a choice of which way to face while seated.

Signage

Many historical cemeteries contain original signage, and while character-defining, these cannot provide all the information needed by the contemporary cemetery visitor. New signs should not detract from the historic feeling of the site. Like seating, modern signs should be carefully designed and unobtrusive, yet easily visible. Signage should be in keeping with the character of the cemetery, and should be designed as a system so that information provided is complementary rather than repetitive, and so the signs themselves are visually compatible. Metal is an appropriate material as it is durable and can be aesthetically pleasing (cast alloys of



aluminum or brass, or engraved plaques, for example). However, sheet metal and plastic are not considered compatible with historical character. While wood is an acceptable material, it has a shorter life than metal signs. Signs can be placed on fencing, rocks, walls and posts, but should not be put on trees. Appropriate signage falls into four categories:¹

1. Information

An identification sign is needed to give the name and perhaps the founding date of the cemetery at the entrance. Other informational signs may include historical information, name of the founder(s), and the names of important persons and locations of their burials. We recommend that a new sign similar to the Pioneers' Home sign be installed near the entrance to the cemetery.

2. Regulation

Rules and regulations for cemetery use should be clearly posted at the entrance. Regulations should address any restrictions to parking, pets, alcohol, funerals, headstones, grave decorations, open hours, etc., and should also have the contact information for the Arizona Pioneers' Home. A warning as to the fragility of older stones can be put here as well.

3. Orientation

Wayfinding signs are extremely helpful to visitors. A

Walter-Kluesing Design Group. <u>Preservation Guidelines for Municipally</u> <u>Owned and Historic Burial Grounds and Cemeteries</u>, Second Ed. Massachusetts Department of Environmental Management, 2002.



Modern Cemetery BMPs - continued

map of the cemetery indicating vehicular circulation and parking, and the historical versus new sections of the cemetery may be placed near the entrance or at road termini. Additional small signs with street or path names, signs with sections names (ex. Memory Walk) are appropriate to locate throughout the grounds, and help to keep visitors on established walkways.

4. Interpretation

Interpretive signage clarifies what the visitor is seeing. These signs may include discussion of any significant aspects of the cemetery such as local history, an explanation of a memorial, a description of plantings, etc. A sign of this type might be included at the new Viewpoint area to show visitors the location of the Arizona Pioneers' Home in the distance.

Vegetation

Vegetation in the cemetery serves multiple functions. Trees provide shade and can serve as wayfinding markers. When clustered together or lining a path they create emphasis and provide a sense of stateliness. Shrubs can be used to block pedestrians from entering an area, and can frame desirable views while screening unwanted views. Forbs and grasses provide groundcover, protecting the soil. All plantings help retain soil by preventing erosion and wind loss, increase soil moisture and nutrient content through additional organic matter, and beautify the site.

Planting Natives

For several reasons, it is strongly recommended that only regionally-native plants be installed at Arizona Pioneers' Home Cemetery. Locally-native plants are adapted to the conditions found in Prescott, requiring less water and maintenance than exotic plants. Exotic species run the risk of either dying or becoming invasive, outcompeting native plants for resources and becoming a nuisance. From a historical standpoint, it is appropriate to plant native species as they would have been found in the area at the time of the cemetery's establishment.

Selecting appropriate plant materials

In order to choose appropriate plant materials, the site context and constraints need to be considered. The cemetery is situated within USDA Plant Hardiness Zone 7 on a south-facing slope. Prescott is classified as being in the Great Basin Conifer Woodland bioregion; Piñon-Juniper series. It is adjacent to grasslands and interior chaparral. This means there is a wide variety of native plant species that are appropriate in this setting. Additional considerations include the fact that irrigation should be minimal or non-existent and that the soil is medium-grained and well drained, but not very rich. All plant materials selected should be hardy, droughttolerant, and require little maintenance. The potential for fire should also be considered. While plant spacing and maintenance are important and no plant is "fireproof," Arizona Firewise has published a plant list of species that are less susceptible to fire for various reasons such as being deciduous, less resinous, having higher moisture

content, have an open growth form, and being slow or low growing. Many of the trees and shrubs in the plant list included in this document are fire resistant.

Planting Guidelines

Grasses

It is recommended that the site be seeded with a mix of grass species as discussed in the erosion control section of this report. Using a mix means a greater likelihood of ground coverage as some species will grow more in certain conditions like shade, lower temperature ranges, etc. than others. Commercially-obtained native grass seed should ideally come from no more than a 100-mile radius away from the site, and from a similar biological area.¹ Mid-June to early July is the best time to seed as it is just prior to the summer monsoon season. Native grasses have been shown to have a substantially higher survival rate when they receive regular deep watering soon after planting. Prior to any planting, existing soil conditions will need to be addressed. In areas of heavy foot traffic soil compaction is likely to be an issue. Ideally, soil should be tilled to a depth of at least 6 inches to allow for future root growth; however, given the high degree of erosion potential associated with tilling on this site, it is recommended that the areas to be seeded are mechanically raked or lightly tilled prior to seeding. Nitrogen fertilizer should not be added to the soil when seeding as it can encourage weeds.

There are several methods for seeding, with hydroseeding being the preferred for the cemetery. Hydroseeding can







have a good success rate and evenly spread the seed over the site. However, the hydroseed mix should not be sprayed in such a way that it might cause damage to grave markers.

Alternatively, seed could be drilled in. Drilled seed typically has the highest success rate as it buries seeds to the appropriate depth, which is $\frac{1}{4}$ - to $\frac{1}{2}$ -inch deep for most native grasses. A pure live seed (PLS) count of 20 to 40 per square foot is recommended.² However, most drillers are large and motorized and should not be used in historic sections of this site. A hand-pushed drill, if obtainable, could be used. Broadcast seeding can be done with a hand-pushed device. It is important to prepare the seedbed in advance of planting by lightly tilling or heavily raking the area to be seeded. A higher PLS count (40 to 60 per square foot) is recommended for this method as there is less seed ending up at the correct planting depth. Lightly compressing the ground where seed has been broadcast (recommended method is dragging a weighted bar over it) after seeding improves germination rates.

Trees and shrubs

Trees and shrubs may be balled and burlap, in containers, or bare root stock. Bare root stock should be kept in a bucket of water or wet cloth to prevent drying out before planting. The minimum size for these plantings should be

 Ecological Restoration Institute of Northern Arizona University. http://www.eri.nau.edu/joomla/
 "Basic Guidelines for Seeding Native Grasses in Arid and Semi-Arid Ecoregions." USDA/NCRS Southwest Plant Center, Los Lunas, New Mexico.



Modern Cemetery BMPs - continued

¹/4-inch caliper at 1 inch above the root, with the shoot-toroot ratio of no more than 2:1, with 1:1 being preferable (e.g. in 2:1, if the shoot is 12 inches, then the roots should be about 6 inches; 1:1 = 12 inch shoot and 12 inch root). Watering tubes can be installed to help establish new bare root or transplant plantings. These tubes are easily made by taking a piece of 1 to 3-inch diameter PVC perforated pipe. The length of pipe should be at least 1/3 longer than the root system of the planting; for large trees, a length of 5' - 6' is recommended. Embed the tube next to the edge of the planting hole with the opening at or slightly above ground level and fill it according to the established watering schedule.

Mulching

Mulching assists in retaining soil moisture, improving water infiltration, protecting plant roots, and reducing erosion. We recommend that mulch be applied to help establish a healthy plant community, particularly in the seeded grass areas. The most desirable mulch for large seeding projects is native grass hay. The hay should be thinly spread so that some ground surface is still visible. Hydromulch wood fiber may be more effective on areas of the site with steeper slopes. Bark, wood chips, or gravel mulch can be used in ornamental planting areas, such as those near benches or walkways. In areas of heaviest erosion and topsoil loss, it is recommended that organic mulch be applied 2 - 4 times per year. This mulch can be derived from chipping limbs or trees that are removed from the site. Compost can also be used, but use of manure is discouraged as it often contains seeds of undesirable grasses and weeds.

Fertilizing

Fertilizing is generally not recommended as it may have negative impacts on historic site features. However, 15 pounds per acre of nitrogen fertilizer may be applied in non-sensitive areas once grass has germinated and reached a few inches of growth.

Moving plants

Moving or transplanting is not recommended unless necessary. A healthy plant may occasionally need to be moved because its roots are disturbing a grave site or walkway. However, careful planting design can prevent such issues from happening by appropriately locating plants when they are installed.

Long-term Planning & Ongoing Maintenance

Maintaining historic sections – see Historic Preservation section.

The Arizona Pioneers' Home Cemetery needs to establish a long term maintenance plan for the grounds as part of its overall management plan. In general, the cemetery has a relatively low visitation rate. Maintenance guidelines, such as those set by the National Recreation and Parks Association (NPRA), can be utilized for the cemetery. We recommend following the Class 1 maintenance guidelines, which assumes light use by visitors. This level of maintenance specified for Class 1 facilities calls for infrequent mowing; annual pruning of trees and shrubs that require it; pest control only as needed; and regular, frequent removal of trash. For more information, see the NPRA manual, *Park Maintenance Standards* (1986).

Irrigation

In general, plants already existing on the site, and those recommended in this report, are hardy, drought tolerant and require little maintenance. However, watering will be beneficial to new plants until they are established, and for ornamental trees, shrubs, grasses and forbs. Larger trees and shrubs should be watered deeply 2-3 times per month in summer before and after the monsoons. Smaller shrubs and perennials will benefit from watering once a week during the driest times of the year.

It will be most beneficial and cost effective in the long run to install an irrigation system for the areas in which ornamental plantings are recommended. Most of the trees and larger shrubs will not need irrigation once established, except as noted above. However, ornamental plantings will benefit from regular irrigation using a drip system. Given that there is no power to the site at present, a solar-powered or combination battery-solar powered irrigation controller is recommended. These are available from most major irrigation manufacturers, such as Hunter, Irritrol and Toro; and come in a variety of configurations that allow radio or PC-based programming. Options are available for climate-based or sensor-based automatic control, which automatically detects on-site climatic changes like rainfall and freezing temperatures. There is also a unit available from LEIT that does not require the use of standard solar panels,







making it more resistant to vandalism or other maintenance issues. Cost for these controllers runs from a low-end, 1-4 station unit at about \$800, to upwards of \$2,000 for units with remote (office-based) operation capabilities. Examples of solar controllers are shown in the images below.

Mowing

Riding mowers should not be permitted particularly sensitive sections of the cemetery, such as the Simmons section. No power tools of any kind should be used near historic gravesites as the blades could potentially knick or damage historic elements. Mowing should be done in alternating directions by row. If the mower has a discharge chute rather than a collection bag, ensure that the chute is pointed away from gravesites. Some cemeteries which are working toward more "green" practices are finding that letting grasses grow longer helps to discourage weeds without the use of pesticides. This method is recommended for Arizona Pioneers' Home Cemetery as the longer grass will also give a more natural grassland appearance and aid in re-seeding. The use of low-growing, desert-adapted grasses such as buffalo grass should help reduce the amount of mowing required, given their relatively low height. However, it is recommended that mowing be done 2 - 4 times per year, even with buffalo grass, in order to keep up a well-maintained appearance. Mowing will also discourage the spread of unwanted



Modern Cemetery BMPs - continued

grasses and weeds.

Preventing unwanted growth

Rather than using pesticides, preventing unwanted growth can be pursued by using certified weed-free seed, delaying fertilizer until after grass seed germination, etc.

Removing Plants

Plants should only be considered for removal if they may cause potential damage to historic elements, are posing a safety hazard, if they are invasive or noxious, or are dying. A plant that will be removed should be cut off at ground level and the root system allowed to die before removal of the roots is attempted.

Climbing vines

If vines have grown on to headstones, they need to be carefully removed rather than torn off in order to prevent damage. The vine should be cut through and allowed to dry out, then gently pulled away from the headstone. Grave markers should then be thoroughly cleaned according to guidelines described previously in this report.

Dead or Damaged trees

Tress in poor condition should be evaluated and cared for by a certified arborist. If necessary they should be removed as described above. However, care should be taken when removing trees to consider their function in the landscape. Were they providing much-needed shade? Did they screen bad views or noise from adjacent properties? If possible, trees should be replaced with an appropriate native tree, as shown in the plant list. In general, the most appropriate large trees for the site are:

- Alligator juniper;
- Arizona cypress;
- Emory oak;
- Pinyon pine; and
- Honey locust.

Snow Removal

Snow removal should be done carefully throughout the site. New drainage structures are suggested along the roadways, and these could be damaged or destroyed by careless plowing. Snow should be pushed into parking areas, though this may displace parking to along the access roads during brief periods. Snow should be removed from walkways by hand as snow blowers can pick up gravel and debris that could be damaging if sprayed at headstones. Snow should be left to melt naturally off of grave sites unless a space is required for an event, in which case it should be removed by hand. Salt should not be used near gravesite or in areas where melting runoff may carry it to gravesites as this can harm both grave markers and plantings. Sand is a more appropriate material for providing traction.

Pest Management

Pest management can be a significant maintenance issue. However, both Arizona Pioneers' Home and Drachman Institute do not wish to cut corners and cause potential environmental and physical damage to the cemetery by using harsh chemical treatments. This means that a long-term plan for pest management will have to be established rather than pursuing short-term solutions. Integrated Pest Management is recommended as it "strives to balance economics, efficacy and environmental risk [in] a sustainable approach...that combines the use of prevention, avoidance, monitoring and suppression strategies to maintain pest populations below economically damaging levels, to minimize pest resistance, and to minimize harmful effects of pest control on human health and environmental resources."¹

Ground Squirrel Control

Ground squirrels have been noted as a particular problem at the cemetery. There are three common types of Ground Squirrels in Arizona. They are Harris' Antelope Squirrel, Round-tailed Ground Squirrel, and Rock Squirrel. All are known for their ability to create underground tunnels and burrows, which can cause severe damage to trees.

The following are commonly used means of Ground Squirrel control: (Recommended)

- One way of deterring squirrels is to cut off their water supply; do not leave any standing water and make sure that there are no leaks is irrigation systems, etc.
- Cages/Traps these can be found at local hardware stores. This includes: box traps, burrow-entrance traps, "Have a Heart" traps. To set up, it is







recommended that the floor of the cage is covered with dirt in order to disguise the wires. Oats, peanut butter, bacon, and apple slices are the recommended bait. Place the trap near a burrow opening on a level/ stable surface. If using Have-A-Heart cages, it is recommended that squirrels be released at least 5 miles away.

• Introduce and/or promote predators such as hawks by creating raptor habitat

(Other)

- Castor Bean Plant seeds this seed is poisonous and can be placed in the burrow of the squirrel.
- Zinc Phosphide this is a single-dose toxicant. Certification is required for obtaining and using it (check with the USDA-APHIS-Animal Damage Control or local Cooperative Extension)

Spoils management

Any earth excavated for graves should be set aside in the area designed by the master plan. This stockpile can be used for maintenance projects such as filling grave slumping or straightening tilted headstones.

1 "Pest Management." Natural Resource Conservation Service, Conservation Practice Standard Code 595. July, 2008.

Sources:

"Basic Guidelines for Seeding Native Grasses in Arid and Semi-Arid Ecoregions." USDA/NCRS Southwest Plant Center, Los Lunas, New Mexico.

Ecological Restoration Institute of Northern Arizona University. http://www.eri.nau.edu/joomla/

Margaret Livingston, Associate Professor of Landscape Architecture, University of Arizona, Tucson. Personal communication, March 12, 2009.

"Pest Management." Natural Resource Conservation Service, Conservation Practice Standard Code 595. July, 2008.

Walter-Kluesing Design Group. <u>Preservation Guidelines for</u> <u>Municipally Owned and Historic Burial Grounds and Cemeteries</u>, Second Ed. Massachusetts Department of Environmental Management, 2002.

MATERIALS IMAGE LIBRARY BENCHES

The images on this and the following pages show examples of materials and site furnishings that can be used at the Arizona Pioneers' Home Cemetery. These examples are not necessarily the exact type, style or color of materials that would be appropriate, but are meant to suggest combinations of colors, shapes and styles that could be incorporated into the cemetery grounds. Numbers on the images refer to the photo credits listed on page 54.

Benches come in a wide variety of shapes, styles and sizes. An appropriate choice for the cemetery would ideally be sturdy, resistant to vandalism, attractive and comfortable. Benches should be anchored into the ground on a concrete slab or footing.



















RAMADAS

A ramada is proposed for the area currently occupied by the maintenance shed near Sharlot Hall's grave. Construction should be simple, utilizing appropriate materials as shown on this page. A good size for the structure would be approximately 20' by 20'.













SIGNAGE, GATES & ARCHES

These photos represent a number of ways that signage can be combined with gateways to make the entry more visible. It is recommended that an entry sign similar to those at the Arizona Pioneers' Home be place near the existing gate. There are no plans to change the existing gate, but if there is a need to replace it in the future, care should be taken to ensure that the style and materials chosen for the gate compliment the sign. Similar materials can be used for smaller signs, as discussed in the design guidelines.



















PATHS & BRIDGES

The master plan in this report recommends installing a "Memory Walk" at some point in the future. These images show some of the materials that could be used for the path. They also show simple bridges that can be installed to cross the vegetated swales recommended for the current and future burial sections.

















WALLS & GABIONS

Ossuary niche walls, stone retaining walls and vegetated gabions could be incorporated into the cemetery grounds at some future date. These examples demonstrate how those types of features can fit elegantly into the existing landscape.











GROUND MATERIALS

The images on this page show a variety of permeable paving materials that would be appropriate in swales, on parking strips, and as a general ground cover where grass is not wanted.





















ARIZONA PIONEERS' CEMETERY | DRACHMAN INSTITUTE

APPENDICES





FUNDING SOURCES

The following section lists possibilities for grants or other funding partnerships that may help make the ideas in this document a reality.

Grants

AZ Centennial 2010 Legacy Project www.azcentennial.gov

(This must be a partnership – perhaps with Sharlot Hall Museum)

As Arizona's statehood turns its first century, with the Arizona Historical Advisory Commission's Centennial plan, efforts to showcase the state's beauty, history and future will be a reality.

The Centennial activities will have financially stimulated major projects that involve community-wide collaboration, to demonstrate the vitality, quality and diversity of Arizona that will contribute to establishing a lasting legacy into the next century. The projects will have enhanced the teaching, learning, and writing of Arizona's history with new content from accurate, original research.

Ideas for legacy projects should be stimulated, perhaps even identified, by the Commission members through working with persons and groups with whom each member individually may be affiliated to develop potential legacy projects that could or should be a part of the Centennial commemoration. All groups are welcome to develop projects. Legacy and research projects might include:

- Restoration of historical properties to public access and use.
- Publication of books and/or articles that enhance knowledge of Arizona's history through new research.
- Creation of public art in commemoration of events or for the Centennial.
- Interpretation through exhibits, public programs, events, discussions in cultural, educational and information institution (such as public television, public radio) of new and/or creative revisions of historical content.

Through such projects, the Centennial would draw tourists to Arizona, as well as interest residents in parts of Arizona they have not visited. The statewide website will document and promote locally-initiated and grass roots activities in communities throughout the state. People of all ages will have participated or will be participating in events in every area of the state that inform, document, present and commemorate Arizona's Centennial

J.W. Kieckhefer Foundation

Eugene Polk – Trustee: (928) 445-4010, PO Box 1151 Prescott AZ 86302

For additional info visit: <u>www.azgrants.com/demo/detail.</u> <u>cfm?PK_ID=67#</u>

Arts and culture; performing arts; art museums; museums; civic affairs; recreational athletics and sports programs; libraries; environmental conservation and preservation; health care organizations; hospitals; hospice programs; medical research; Alzheimer's education and research programs; programs for the developmentally disabled; religious agencies and organizations; social services; programs for children and youth; youth development programs; programs for women; programs for the elderly; programs for the homeless; housing and shelter programs

Harold James Family Trust

8400 N Hwy 89, Prescott AZ 86301

This Trust has done a lot to preserve and enhance the cultural richness of Prescott. Recent contributions included funding for the Elks Lodge Theatre restoration and a large donation of land to be utilized as 'Open Space'.

Wal-Mart and Sam's Club

(Prescott Valley Club Manager: Brandon Holmes, 928-778-5042)

Save Our History

www.history.com/minisites/saveourhistory

"Save Our History," a program of the History Channel and the American Association for State and Local History, is a national initiative that supports local history education and historic preservation efforts in communities across the United States.

Each year, Save Our History awards a total of \$250,000 to history organizations that partner with schools or youth groups on preservation projects that engage students in learning about, documenting, and preserving the history of their communities.

Eligible applicants are required to be nonprofit 501(c)(3) history organizations such as a museum, historical society, preservation organization, historic site, library, or archive. Other eligible applicants include local government agencies such as a parks and recreation commission, historic commission, department of local history, or other local government agency that owns and/or operates a historic site or property. Applicants must be located in one of the fifty states or the District of Columbia.

Applicants must partner with local elementary, middle, or high school(s), or organization(s) that provides educational programming for children of similar ages to design a historic education and preservation project. Organizations that have received a Save Our History grant in the last three years are not eligible to apply.

Arizona Humanities Council

www.azhumanities.org/ggrants1.php

Cultural Heritage Tourism Grants

Through the National Endowment for the Humanities *We The People* initiative, AHC supports the development and implementation of projects that leverage the State's cultural and historical assets to promote tourism and regional economic development. Cultural heritage products must provide accurate and authentic interpretation of an area's history and heritage by qualified humanities scholars and demonstrate the potential to attract out-of-town tourists.

Eligible applicants include Arizona museums, historic houses, archaeological sites, and heritage centers that are constituted for nonprofit purposes, or are parts of governmental or tribal entities. Applicants may request up to \$10,000, which must be matched by in-kind contributions.

Project Grants

AHC also offers Project Grants. These awards are support innovative, community-based projects and partnerships that expose Arizonans to humanities scholarship in the following areas:

- Cultural heritage development
- Cultural literacy
- Civil discourse on timely social and cultural issues

AHC welcomes proposals from a wide range of nonprofit (501c3) organizations, and encourages projects that are innovative in their approach toward the humanities and public programming. We especially encourage projects that:

- Promote critical thinking and community conversation
- Promote public interaction with humanities scholarship
- Employ innovative, accessible public programming formats

Applicants may request up to \$5,000, which must be matched by in-kind contributions. An additional amount up to \$5,000 may be requested if matched by third-party cash contributions, which must be in place at the time of application.

U.S. Fish and Wildlife

www.fws.gov/southwest/es/arizona/Partners.htm

Arizona Partners for Fish & Wildlife

Habitat restoration and conservation is vital to improving and preserving Arizona's fish and wildlife resources. Since 1992, the Service has provided technical and financial assistance to Arizona landowners who voluntarily want to increase the value of their lands as wildlife habitat. Up to \$25,000 is available for each Partners project selected; it is possible to receive more than this amount for outstanding projects.

Landowners are reimbursed for costs they incur while implementing an approved project (i.e., the landowner pays for the materials, labor, and other project expenses and submits receipts to the Service for reimbursement). Most landowners contribute to the total project costs in the form of in-kind services and/or cash. Contributions by landowners are encouraged and taken into consideration when the Service selects projects for funding. Habitat restoration and enhancement projects may include, but are not limited to: installing fencing along riparian areas to exclude livestock; rehabilitating in-stream aquatic habitats; restoring wetland hydrology; removing nonnative plants; planting native grasslands; and planting native trees, shrubs, and other plants to provide food and shelter for fish and wildlife in degraded habitats.

Arizona Community Tree Council, Inc.

www.aztrees.org or www.azsf.az.gov/forest management/urban_and_community_forestry.asp

Community Challenge Grants

Community Challenge Grants are awarded through the Arizona State Forestry Division - Urban & Community Forestry in cooperation with the USDA Forest Service. This program is to encourage citizen involvement in creating and supporting long-term and sustainable urban and community forestry programs at the local level.

The grant requests can be made in the amount of \$2,000 to \$20,000 (new grant amounts for this year) per grant. The approximate total amount to be awarded will be \$200,000. The grants are 50/50 matches and cannot be matched with federal funds. Organizations such as cities, towns, non-profits and counties may apply for this funding. The grant cycle is normally announced in the spring with the grants due in August.

Arizona Game and Fish

www.azgfd.gov/w_c/heritage_apply.shtml

<u>Heritage Fund Grant</u> (Urban Wildlife & Urban Wildlife Habitat)

Arizona voters created the Heritage Fund in 1990, designating up to \$10 million a year from lottery ticket sales for the conservation and protection of the state's wildlife and natural areas.

The Arizona Game and Fish Department spends its Heritage Fund dollars to recover threatened and endangered species, to help urban residents appreciate and coexist with our unique wildlife, to educate children about the environment, and to create new opportunities for outdoor recreation.

Eligible applicants include the federal government or any federal department or agency, Indian tribe, this state, all departments, agencies, boards and commissions of this state, counties, school districts, cities, towns, all municipal corporations, and any other political subdivisions of this state.

Arizona Department of Water Resources www.azwater.gov/dwr/

Unfortunately, the Pioneer's Home Cemetery project is not eligible for ADWR's main source of funding: the Water Projection Fund (funds swept for 2009 budget year). The Arizona Water Protection Fund supports projects that:

- Develop or implement on the ground measures that directly maintain, enhance and restore Arizona's river and riparian resources.
- Acquire Central Arizona Project water or effluent to restore and maintain river and riparian resources.
- Conduct innovative river and riparian research.
- Implement water conservation measures/programs outside of the 5 Active Management Areas (AMAs).

The Pioneer's Home Cemetery is within the Prescott AMA and is not directly involved with riparian mitigation. However, the Prescott AMA periodically has funds available for water conservation projects such as installing xeriscape and planting native species. For more information, contact:

Crystal Frost Prescott Active Management Area 928-778-7202 2200 East Hillsdale Road Prescott, AZ 86301

Grant research and writing resources (free or low cost)

Grants to You

grantstoyou.org/chapter/chapterdisplay.php?id=3

Through local chapters, Grants to You provides free or very low cost volunteer grant writing and education classes to primarily senior citizens, students and other motivated citizens who are computer comfortable, have a strong interest in supporting their community and who will designate a particular local non-profit agency to assist in their grant writing efforts.

Shirley Baskin, Program Coordinator 4926 Antelope Drive Prescott, AZ 86301 Phone: 928-776-7976

AZ Gates (Arizona Grants Access Tool and Expert's Source)

azgates.asu.edu

The Arizona Grants Access Tool and Experts Source (AZ GATES) was created by Arizona State University and the Arizona-Mexico Commission to serve as Arizona's premier resource for obtaining funding for priority projects throughout the state. Registration is free and required to receive full access to the website and database.

Just Grants! Arizona

www.azgrants.com

A non-profit offering subscription service for a statespecific grant and Requests For Proposal (RFPs) guide.

Foundation Center

foundationcenter.org

The Foundation Center is a comprehensive database on U.S. grantmakers and their grants. The website also lists RFPs through the Philanthropy News Digest. The Foundation Center offers an array of free and affordable educational programs.

In-Kind Donations

Watters Garden Center

1815 W Iron Springs Road, Prescott AZ 86305(928) 445-4159Plant materials (both native and non-native)

Mortimer Nursery

3166 Willow Creek Rd, Prescott AZ 86301 (928) 776-8000

www.mortimer-nursery.com

Irrigation supplies, plant materials, landscaping boulders, decomposed granite, outdoor furniture

Pro-Water Irrigation Supplies

629 Miller Valley Rd, Prescott AZ 86301(928) 778-7771Drip, Irrigation & Drainage, Erosion control,

Controllers, Parts & Supplies, Pipe, etc.

Dunbar Stone & Masonry

1041 Commerce Dr, Prescott AZ 86305

(928) 445-7880

Boulders, Building stone, Crushed rock, Cut stone, Flagstone, Etc.

Ewing Irrigation

8267 E Pecos Dr, Prescott Valley AZ 86314 (928) 775-9803 www.ewing1.com/general/ews_loc_137map.htm

Mineral Park Decorative Rock

Kingman, AZ (928) 777-0393 All types of landscape rock

Outdoor Benches

<u>Note</u>: finding proper benches locally may prove to be difficult. Metal benches are preferable for their durability (although they cost more initially). Naming opportunities and/or in-kind donations from families might help offset these costs.

Visit <u>Upbeat Site Furnishings</u>: <u>www.upbeat.com</u> and do a search for "Outdoor Benches". Recommended models are:

- Blair Steel Bench, Item #PB6BLAIR \$1,100.00
- 4' Steel Slat Bench, Item #M4-BCH \$680.00
- 4' Rendezvous Bench with Cast Iron Ends, Item #L1361 \$840.00

Miscellaneous Sources of Support

- Boy Scouts of America (local chapters) to fulfill specified projects
- United Voluntary Services labor
- www.unitedvoluntaryservices.org
- Vietnam Vets of America Inc.
- Arizona Federation of Garden Clubs (local chapter)
- American Legion Ernest E Love Post
- AZPH family and friends
- Lions or Shriner groups

IMAGE CREDITS

All images used in this document were taken by Elizabeth Scott and Emily Yetman, except as noted below.

- COVER Military graves in historic section: The Daily Courier staff photo.
- P 8 Historic Pioneers' Home photo: http://www.azph. gov/history.asp
- P 29 Bioswale section: http://mcookedesigns.com/ images/Bioswale%20section.jpg Permeable paving: http://www.ci.costa-mesa.ca.us/ departments/green-building/home_files/lowimpact-3.jpg Permeable paving installation: http://www.cetco.com/ CCS/images/Applications/DSC00328.JPG Permeable paving closeup: http://www.bren.ucsb.edu/ research/2001Group_Projects/stormwater/Public/ porpavment.jpg

Bioswale (bottom far left): http://www.

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P44 - Solar irrigation controller installation: http://uwrl. usu.edu/researchareas/waterresources/images/stormfig9. jpg

Solar controller and ramada: http://www.controltechusa. com/Willow%20Trace%20Cropped.jpg Closeups of solar irrigation controllers: http://www.

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MATERIALS IMAGE LIBRARY

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#2: http://www.londongardens.net/assets/images/
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RAMADAS

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SIGNAGE, GATES & ARCHES

#1: http://www.breckenridgebyowners.com/pictures/ carricarte0505western%20sky%20ranch%20sign.jpg #2: http://farm3.static.flickr.com/2072/2242612587_ b8d8dbb41e.jpg?v=0 #3: http://www.cem.va.gov/cem/images/ cemphotos/821_rockisland.jpg #4: http://members.tripod.com/~Shady_Hollow/ Cemetery_Design/Gates_Fences/169-6986.jpg #5: http://www.lrcitybeautifulcommission.org/images/ CityHallRockPlaqCR3.JPG #6: http://www.warrenville.il.us/ktmllite/files/ uploads/Boards%20and%20Commisions/06016%20-%20Entry%20Sign.jpg #7: http://www.sublette.com/community/scrashesmarker5.jpg #8: http://www.users.bigpond.com/raluebbers/AIPA/ Signs2.jpg

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PATHS & BRIDGES

#1: http://images.google.com/hosted/life/

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