Final Environmental Assessment

Caliente Youth Center Bridge Flood Mitigation Project

State of Nevada

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1 Introduction

Through the State of Nevada Division of Emergency Management (NDEM), the State of Nevada Public Works Division (SPWD) applied to the United States Department of Homeland Security (DHS) Federal Emergency Management Agency (FEMA) Region IX Pre-Disaster Mitigation (PDM) Program for funding to implement a flood mitigation project in the City of Caliente in Lincoln County, Nevada. The PDM Program was authorized by Section 203 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, Title 42 of United States Code Part 5133 as amended by Section 102 of the Disaster Mitigation Act of 2000 (Public Law 106-390, 114 Statutes 1552) to assist states and communities with implementation of sustained, pre-disaster, natural-hazard mitigation programs with the objective of reduction to overall risk to the population and structures, while reducing reliance on funding from actual disaster declarations.

FEMA prepared this Environmental Assessment (EA) to evaluate the impacts of SPWD PDM Program project. The EA was prepared according to the requirements of the National Environmental Policy Act of 1969 (NEPA), the Council on Environmental Quality regulations implementing NEPA (Title 40 of the Code of Federal Regulations [CFR] Parts 1500–1508), and FEMA's implementing regulations (44 CFR Part 10).

The FEMA-guided EA process provides steps and procedures to evaluate the potential environmental, social, and economic impacts of a proposed project and alternatives as well as an opportunity for the public and local, state/territorial, and other federal agencies to provide input and/or comment through scoping studies and a public comment period. These potential impacts are measured by their context and intensity, as defined in the Council on Environmental Quality (CEQ) regulations.

2 Purpose and Need for Action

2.1 Purpose and Need

The purpose of the PDM Program is to assist states and communities with implementation of sustained, pre-disaster, natural hazard mitigation programs to reduce overall risk to the population and structures, while reducing reliance on funding from actual disaster declarations. Therefore, the purpose of the proposed project is to provide PDM Program funding to SPWD to design, acquire environmental clearance, and permit a safe and permanent solution to the access, flooding, and unstable stream bank conditions in and around the Caliente Youth Center access road crossing of Clover Creek in Caliente, NV.

Past flood events and potential climate change impacts create a need to develop and implement design solutions. The design solutions need to incorporate the following goals:

- Eliminate flooding access issues for the Caliente Youth Center.
- Increase public health and safety for the residents and staff of Caliente Youth Center and the community as a whole.
- Improve stream hydraulics by improving stream dynamics.
- Reduce flood hazards to the community's critical infrastructure (water and sewer).
- Protect the community's electrical substation.
- Reduce the financial cost of after-the-fact flood clean-up.

A flood event in January 2005 jeopardized the safety of residents and staff by preventing CYC relief staff and emergency vehicle access to the CYC facility for evacuation of residents and staff and by creating the potential for flooding of adjacent CYC structures. Flows emanating from the Clover Creek watershed exceeded culvert capacity and overtopped the roadway to a depth of three to five feet. Concern for the rising floodwaters resulted in an air evacuation of the residing children and CYC staff using Blackhawk helicopters dispatched from Nellis Air Force Base. During the 2005 event, significant flooding occurred further downstream through the community and resulted in damage to homes, roads, businesses, and utilities. Damages exceeded $856,656 and included the destruction of the City's municipal drinking well.

Following the 2005 flood event, the City of Caliente diligently labored to excavate six to eight feet of accumulated sediment from the culverts. When the December 21, 2010 flood event occurred, City personnel immediately initiated debris removal efforts in an attempt to maintain culvert conveyance until it was no longer safe to continue these operations. The backwater and debris from this event resulted in severe erosion along the south bank immediately upstream from the culverts, and threatened the electrical substation that supplies power to the entire community. The streambank, which was approximately 15 feet from the electrical substation, eroded to within 3 feet of the substation. A declaration of emergency was initiated by the City, the County and State, and private contractors were mobilized to reinforce the rapidly-deteriorating bank with rock reinforcement. Because of the previous maintenance efforts and the City's quick response to debris removal, the substation and access road were saved. Damages associated with this event were $135,830.

The risk of repeat flooding of the access road because of reduced culvert conveyance remains a problem. Because of accumulated sediments, the culverts under the CYC access road now have only 1.5 to 2.0 feet of free opening (out of 12 feet). If this crossing is not removed and replaced with an improved structure, the access road and surrounding improvements remain at risk of flood inundation from relatively frequent hydrologic events. Additionally, critical infrastructure is at risk with the electrical substation being in close proximity to the channel and sewer and water infrastructure being located within the roadway above the existing culvert. If the access road is damaged during a future flood event, it is likely both the sewer and water infrastructure will be destroyed. Therefore, action is required to reduce flooding hazards and provide protection for the population and both public and private property within the Clover Creek watershed in the City of Caliente.

2.2 Existing Conditions

The Caliente Youth Center (CYC) is located in Caliente, Nevada (Figure 1 and 2). The facility provides correctional care for as many as 140 children committed to the care of the Nevada State Division of Child and Family Services. The staff-secure facility has seven housing units, five units for males and two units for females — all residents are age 12–18. CYC is the only state-operated correctional facility for females of this age. This center, along with the Lincoln County School District, operates rehabilitative and educational programs that offer required and elective academic subjects, remedial programs, special education, vocational education, and interscholastic activities. In addition, CYC employs as many as 100 state personnel.

Youth Center Drive is the single point of access to both the CYC facility and the Hot Springs Motel. The road crosses Clover Creek near the confluence of Clover Creek and Meadow Valley Wash. The crossing comprises two, twelve-foot pipe culverts and a concrete headwall. While these culverts provide sufficient capacity for relatively frequent events, they are significantly undersized for severe flood events. Recurrent flooding from heavy precipitation events in the adjacent higher elevations coupled with construction of several flood-protection reservoirs resulted in sediment aggradation and debris buildup in the Clover Creek culverts. Sediments generated from a 5-year, 24-hour storm event can create channel bed aggradations up to 3 feet upstream from the culvert inlet, which will totally block the culvert entrance. The excessive sediment and debris deposition and flooding is a chronic maintenance problem for Caliente. While the City has made significant efforts to reduce sediment accumulations in and upstream of the culverts, the combination of lack of culvert capacity and structural barriers to stream hydraulics can only be resolved with replacement of the culverts with a spanning structure (bridge).

2.3 Project Description

The project involves removal of the existing twelve-foot diameter pipe culverts and concrete headwall. The conveyance of the existing culverts is insufficient to adequately pass flows, sediment, and debris from moderate flood events. The existing culverts are substantially undersized for severe flood events (Figure 2). The proposed project would replace the existing culverts with a spanning structure (bridge) with sufficient capacity to allow passage of the 100-year flood event and associated sediment and debris without overtopping the access road. The required size of the structure is 90 feet long with a width of 40 feet. The proposed structure is depicted in Appendix A, Figures 3 and 4. The bridge would span the entire width of the channel and would not require piers to be constructed in the channel. All bridge members (e.g. girders, expansion joints, etc.) would be placed above the high water mark, providing one lane of travel in each direction. Construction would include the bridge approaches, abutments, wingwalls, and bank armoring. The clear opening from the bed elevation to the underside of the bridge is approximately 13 feet. In addition to replacement of the culverts, the project would include relocation of sewer and water infrastructure, as well as bank stabilization both upstream and downstream from the project site. Appropriate temporary (during construction) and permanent Best Management Practice (BMP’s) and mitigation measures would be employed as an important project element to insure the protection of soil, water, air, biological and historic properties and archaeological resources.

In addition, a grade control structure would be constructed upstream from the crossing to provide a base level control point for the channel. The proposed rip-rap grade control structure would be constructed in Clover Creek approximately 200 feet upstream from the existing Youth Center Drive culverts, as shown in Appendix A, Figure 5. The purpose of the grade-control structure is to protect the channel from an upstream headcut and reduce the likelihood of mobilization and transport of stored sediments in the channel. This in-channel grade control structure provides a point in the streambed that is capable of resisting natural erosive forces from propagating erosion further upstream. This structure would also serve to dissipate energy during high discharge events. The grade control structure would be approximately 20 feet deep filled with rip-rap or large dense rocks. At channel grade, the grade control structure would be approximately 90 feet long by 65 feet wide. Below grade the structure would narrow to 50 feet long by 25 feet wide.

As part of the proposed project, approximately 2,500 square feet of existing pavement would be removed, and approximately 3,050 cubic yards of earthwork would be excavated and graded at the location of the existing culverts and adjacent banks. An additional 2,630 cubic yards of excavation would be required for the grade control structure. To facilitate construction of these improvements, a temporary graded road would be necessary to provide access to existing uses upstream of the project site. A culvert would be used to convey normal channel flows beneath the temporary road during construction. On completion of the proposed project, the temporary road and culvert would be removed and disturbed earth surfaces revegetated prior to project completion.

Staging areas would be located within paved and other previously disturbed areas near the project area. The project would involve the removal of vegetation along the streambanks. Construction would occur during the seasonally dry months, August through November, which would also avoid the breeding season of migratory birds that may nest in or adjacent to the project site. The proposed project would be completed within 120 days.

3 Analysis of Alternatives

Several alternatives for reducing the flood hazard caused by the Clover Creek were evaluated.

3.1 Alternatives Not Carried Forward

In order to reduce flooding hazards and provide protection for the population and both public and private property within the Clover Creek watershed, the State of Nevada considered eliminating the crossing and access road, replacing the existing access road and culverts with a low-water crossing , and relocating the access road to the north on private property. However, the State of Nevada determined that these methods would not meet the purpose and need. Eliminating the crossing and access road is not reasonable because there is no other feasible route to provide access to the CYC facility. Likewise, the low-water crossing alternative was eliminated because access is required to the Center during flood events. There are a number of full-time residents, including students and staff, that are on the site at all times. Therefore, emergency services must have access to the site during flood events (and other times).

During the scoping process it was suggested by the Natural Resource Conservation Service to relocate the access road to the north and provide ingress and egress off of U.S. Route 93. This potential alternative was eliminated because of the need to acquire an easement on private property, the potential cost of acquiring such an easement, and potential issues with ingress and egress from U.S. Route 93.

As a result, none of these alternatives was considered reasonable for further analysis.

3.2 Alternatives Carried Forward

3.2.1 *Alternative 1: No Project*

Under CEQ regulations the inclusion of a No Project Alternative is required in the environmental analysis and documentation. The No Project Alternative is defined as maintaining the status quo with no FEMA financial assistance to construct a specific project. The No Project Alternative is used to evaluate the effects of not providing federal assistance for the proposed project, thus providing a benchmark against which the “a range of reasonable alternatives” can be evaluated. For the purpose of this alternative, it is assumed that SPWD would be unable to implement the proposed project without federal assistance and the flood hazard remains unmitigated at the project site.

3.2.2 *Alternative 2: New Clear-Span Bridge*

The proposed project involves removal of two existing twelve-foot pipe culverts and concrete headwall. The two culverts would be replaced by a clear-span structure (bridge) 90 feet long with a width of 40 feet that would be able to convey 100-year flood flows without overtopping the road, as depicted in Figures 3 and 4. The bridge would span the entire width of the channel and would not require piers to be constructed in the channel. All bridge members (e.g. girders, expansion joints, etc.) would be placed above the high water mark. The proposed structure would provide one lane of travel in each direction. Construction would include the bridge approaches, abutments, wingwalls, and streambank armoring. The clear opening from the streambed elevation to the underside of the bridge would be approximately 13 feet. In addition to replacement of the culverts, the project would include relocation of sewer and water infrastructure, as well as bank stabilization upstream and downstream of the project site, and construction of an upstream grade control structure.

As part of the proposed project, approximately 2,500 square feet of existing pavement would be removed, and approximately 3,050 cubic yards of earthwork would be excavated and graded at the location of the existing culverts and adjacent banks. An additional 2,630 cubic yards of excavation would be required for the grade control structure. To facilitate construction of these improvements, a temporary low-water crossing (graded road) would be necessary to provide access to existing uses upstream of the project site. A culvert would be used to convey normal channel flows beneath the temporary road during construction. On completion of the proposed project, the temporary road and culvert would be removed and disturbed earth surfaces revegetated prior to project completion.

Staging areas would be located within paved and other previously disturbed areas near the project area. Appropriate temporary (during construction) and permanent BMP and mitigation measures would be employed as an important project element to insure the protection of soil, water, air, biological and cultural resources. Construction would occur during the seasonally dry months, August through November, which would also avoid the breeding season of migratory birds that may nest in or adjacent to the project site. The project would be completed within 120 days.

3.2.3 *Alternative 3: Enlarged Concrete Arch Culverts*

For Alternative 3, a double 42-foot by 12-foot ConSpan prefabricated concrete arch culvert system would allow discharge from minor flood events with annual exceedance probabilities of 0.1 to 0.2 or more (5- to 10- year events) to pass through the culvert system without overtopping the crossing. Additionally, from a hydraulic perspective it also would allow discharge from the 100-year event to pass through the culvert system without overtopping the crossing. However, although Alternative 3 would have capacity to convey larger flood waters, the design would still present a barrier to large woody debris with the potential of blocking the passage of flood waters and the accumulation of sediment. In a large flood event, it is certain that debris will be transported down the creek and the debris load would be substantial. If this occurs, there is a great likelihood that additional debris and sediment would be trapped and the structure would fail hydraulically and perhaps physically as well. Therefore, the potential for the accumulation of transported woody debris and sediment reduces the hydraulic capacity of the structure, resulting in the potential for the road to overtop during a 100-year event.

This alternative would also include relocation of sewer and water infrastructure, as well as bank stabilization both upstream and downstream from the project site, and construction of an upstream grade control structure. Machinery, staging areas, BMP and mitigation measures, and construction times would be similar to those for the proposed project alternative.

Alternative 3 would require continued maintenance due to sediment aggradation upstream from the structure and would have less ability to transport sediment than Alternative 2. Therefore, although Alternative 3 is hydraulically equivalent to Alternative 2, it is not equivalent regarding maintenance, sediment transport or debris passage.

4 Affected Environment, Impacts, and Mitigation

4.1 Geology, Seismicity, and Soils

Geology

The geologic history of southeastern Nevada is complex and includes several episodes of sedimentation, volcanic activity, orogenic deformation, and continental drifting. The project area is located within the Central Nevada Basin and Range physiographic province. The dominant landforms are north-south trending mountains separated by broad, sediment filled valleys, many of which have internal drainages. Mountains were formed by faulting and were modified subsequently by erosion. Large alluvial fans developed at the mouths of most canyons. Undifferentiated volcanic rocks from the Miocene and Oligocene epochs occur in this region. Rhyolites and andesites also occur. Sedimentary rock from the Miocene-Pliocene epoch are present, along with sedimentary rock from the Pennsylvanian period. Limestone and dolomite from the Cambrian period occur as well. Many of the mountain ranges comprise intrusive igneous rock. Playas are evident in the internally drained valleys of the project region (Pampeyan, 1993).

Seismic Safety

Located in a region of Central Nevada that is relatively seismically inactive, the City of Caliente experiences an earthquake on the average once every few decades (NISTAC, 2008). The bridge design would include seismic safety and would be constructed to achieve appropriate earthquake resistance.

Soils

The City of Caliente is located at the confluence of Meadow Valley Wash and the Clover Creek. Bedrock in Rainbow Canyon and Clover Canyon was eroded by the streams that drain these watersheds. The Caliente area is underlain by alluvial deposits approximately 200 feet thick (E.H. Pampeyan, 1993). These deposits, comprising clay, silt, sand, and gravel, have the potential to yield moderate to large supplies of groundwater while the surrounding consolidated rocks, mainly igneous with some sandstone and shale, yield small supplies of water. One principal soil type is found within the project area. It is a stony or gravelly loam formed from igneous-derived colluvium, over residuum weathered volcanic rock.

4.1.1 *Alternative 1: No Project*

There would be no potential effects on geology and seismicity. However, under the No Project Alternative the current condition of the two existing culverts would remain the same and continue to have insufficient capacity to convey flows from hydrologic events of appropriate design level for the access to the CYC facility. Sediment aggradation would continue to exasperate conditions during flood events, and continue to result in stream bank erosion. Based on the Sunrise Engineering (2008) hydrologic and hydraulic analysis, sediments derived from a 5-year, 24-hour storm might create channel aggradation to a depth of three feet above base level at the culvert inlet, which would completely block the culverts.

The No Project Alternative would not achieve the project goals of eliminating flooding access issues for the Caliente Youth Center, increasing public health and safety for the residents and staff of Caliente Youth Center and the community as a whole, improving stream hydraulics, reducing flood hazards on critical infrastructure and reducing the financial cost of flood clean-up.

4.1.2 *Alternative 2: New Clear-Span Bridge*

The geology and potential for seismic activity would remain unchanged. Construction of a clear span bridge, stream bank stabilization, and a grade control structure midstream would be completed. The result of these structures would be to improve stream hydraulic conditions such that the sediment transport by Clover Creek would approach dynamic equilibrium through the project area stream reach. A bridge with a clear span of 90 feet would allow the 100-year event to pass through the structure without overtopping the CYC access road (Thompson, 2011). Construction of the clear span bridge would result in the restoration of sediment transport to approximately the same rate that existed prior to the construction of the CYC access road and installation of the two, 12-foot diameter culverts.

As a result of construction activities, soils within the project area would be disturbed through excavation within the stream, along the stream banks to key in stabilizing riprap, removal of vegetation for the construction access road and the bridge construction. Soil disturbance would be kept to a minimum necessary to implement the proposed project. BMP mitigation measures would be employed. These practices would be employed on both a temporary (during construction) and permanent basis and would include implementing an erosion and sedimentation control plan, installation of temporary construction silt fencing, scarifying compacted soils and mulching and or revegetation of bare soils.

The New Clear-Span Bridge Alternative would achieve all the project goals by completely removing the current impediments to flows of a 100-year flood event and providing significant, long-term reduction in flooding access issues for the Caliente Youth Center, increasing public health and safety for the residents and staff of Caliente Youth Center and the community as a whole. The New Clear-Span Bridge Alternative will also provide significant long-term improvements to stream hydraulics, major reduction of flood hazards on critical infrastructure and major reduction in the financial cost of flood clean-up.

4.1.3 *Alternative 3: Enlarged Concrete Arch Culverts*

The alternative would have no potential effects on geology and seismicity.

The alternative would have potential effects on soils. The Enlarged Concrete Arch Culverts Alternative includes the replacement of the two existing culverts with two 42-foot x12-foot ConSpan concrete arch culverts. As a result of construction activities, soils within the project area would be disturbed through excavation within the stream, along the stream banks to key-in stabilizing riprap, removal of vegetation for construction of the access road and the new arch concrete culvert construction. Soil disturbance would be kept to a minimum necessary to implement the proposed project. BMP mitigation measures would be employed. These practices would be employed on both a temporary (during construction) and permanent basis and would include implementing an erosion and sedimentation control plan, installation of temporary construction silt fencing, scarifying compacted soils and mulching and or revegetation of bare soils.

This alternative would not completely achieve all goals. The Enlarged Concrete Arch Culverts Alternative would have the capacity to convey flood waters, however, the design would still present a barrier to large woody debris with the potential of blocking the passage of flood waters and the accumulation of sediment and bank scouring during a 100-year flood event. This alternative would reduce flooding access issues for the Caliente Youth Center during minor flood events with annual exceedance probabilities of 0.1 to 0.2 or more (5- to 10-year events) resulting in short-term, minor improvements to public health and safety for the residents and staff of Caliente Youth Center and the community as a whole. There would also be short-term, minor improvements to stream hydraulics, reduction of flood hazards on critical infrastructure and reduction in the financial cost of flood clean-up.

In a large flood event, it is certain that debris will be transported down the creek and the debris load would be substantial. If this occurs, there is a great likelihood that additional debris and sediment would be trapped and the structure would fail hydraulically and perhaps physically as well. Therefore, there remains a major risk that flooding will overtop the road preventing access to or from CYC, and damaging or destroying critical infrastructure.

4.2 Air Quality

The Clean Air Act is a comprehensive federal law that regulates air emissions from airsheds, stationary and mobile sources. It authorized the USEPA to establish National Ambient Air Quality Standards (NAAQSs) to protect public health and the environment. The NAAQSs include standards for the following five criteria pollutants: nitrogen dioxide (NO2), ozone (O3), carbon monoxide (CO), sulfur dioxide (SO2), and particulate matter less than 10 micrometers in diameter (PM10). In addition, new NAAQSs for ozone and particulate matter less than 2.5 micrometers in diameter (PM2.5) have been implemented. Areas where the monitored concentrations of a pollutant exceed the NAAQS are classified as being in nonattainment for that pollutant. If the monitored concentrations are below the standard, the area is classified as in attainment. The project area is within an attainment area for all criteria pollutants.

4.2.1 *Alternative 1: No Project*

Under the No Project Alternative, air quality standards would not be directly impacted. However, both short-term and long-term increases in particulate matter would be a result from accumulation of sediments on the upstream side of the existing culverts where they are exposed to wind erosion.

4.2.2 *Alternative 2: New Clear-Span Bridge*

Proposed project would result in minor, short-term deterioration of air quality from construction activity. The construction related effects of the project would be limited to resuspended fugitive dust (particulate matter) and construction equipment emissions. However, long term impacts would be reduced significantly from current conditions due to improved sediment transport hydraulics and the removal of in-stream structural impediments to stream flow. With the reduction of sediment aggradation there would be a corresponding reduction in resuspended particulate matter from wind.

There are no homes immediately adjacent to the project area. The CYC is set back from the project area by approximately 400 yards and the residences along Spring Street are set back from the project area by 300 yards. Due to these proximities, emissions during construction are included in our analysis. Emissions from construction equipment were estimated using emission factors developed by the South Coast Air Quality Management District in California (2005) which is an accepted protocol for measuring construction equipment emissions (NISTAC, 2008). This protocol is based on an 8-hour day and assumes a 50% load factor (each piece of equipment would be used for 4 hours per day). The annual emission totals assume the project would take 90 days for the placement of the prefabricated bridge and construction of the other alternative elements and all equipment would be used for the entire construction period.

Table 1 – Air Quality Emissions from Construction

Equipment Description	Carbon Monoxide	Nitrogen Oxides	Sulfur Oxides	PM_{10}
Emission Factors (pounds per hour)				
Excavator	0.48	1.23	0.24	0.07
Loader	0.42	0.83	0.12	0.08
Dump truck	0.04	0.08	0.00	0.00
Emissions Estimates (pounds per day)				
Excavator[1]	3.81	9.84	1.94	0.52
Loader[1]	3.37	6.67	0.92	0.67
Dump truck[1]	0.35	0.62	0.00	0.00
Total	7.53	17.13	2.86	1.19
Emissions Estimates (tons per year)				
Total	0.34	0.77	0.13	0.05

[1] Estimate assumes two pieces of equipment.

Under the assumptions identified above, total emissions would fall well below the significant emissions thresholds established by USEPA. Emissions below these thresholds would not cause or contribute to a violation of any NAAQS. To minimize air quality impacts due to fugitive dust BMP mitigation measures would be employed that include at a minimum covering spoil piles, covering the haul vehicle loads (containing fill or cut materials), and keeping fugitive dust to a minimum in active construction areas by spraying the site with water as appropriate.

4.2.3 *Alternative 3: Enlarged Concrete Arch Culverts*

Implementation of this alternative would result in minor, short-term deterioration of air quality from construction activity. However, minor long term improvements would be a result due to the increased capacity of the new enlarged culverts that would convey most flows and reduce sediment, thereby reducing the amount of sediment available to be resuspended by wind.

4.3 Water Resources and Floodplain Management

Water Resources

All watersheds within Lincoln County are entirely within the Colorado River Hydrographic Basin. Meadow Valley Wash and Clover Creek are important sources of recharge to the local groundwater system and are the only perennial streams that run through Caliente. Clover Creek and Meadow Valley Wash flow west and south, respectively, before they converge and flow though the City of Caliente in a southwesterly direction as Meadow Valley Wash. The watershed areas for the upper Meadow Valley Wash and Clover Creek are 979 and 364 square miles, respectively (Sunrise Engineering, 2008). Groundwater flows in a similar pattern following the wash and creek. Groundwater is the principal source of domestic and industrial water supply because it is more abundant and has a higher quality than surface water within Caliente.

The alluvial aquifer along Meadow Valley Wash and Clover Creek is capable of yielding a significant quantity of groundwater. There are numerous wells within the alluvial aquifer in the Caliente area. Well depths are less than 220 feet and static water levels are generally shallow. Yields exceeding 1,000 gpm are reported for alluvial aquifer wells in Clover and Rainbow Canyons. Groundwater quality is generally good, with few exceptions, and meets the drinking water standards for those constituents analyzed (NISTAC, 2008).

Drinking water for the City of Caliente meets or exceeds federal and state water quality standards. However, elevated arsenic concentrations have been reported in some wells in the City of Caliente and its vicinity. Meadow Valley Wash from the north contributes to elevated arsenic concentrations in the City of Caliente while Clover Creek from the east and Newman Canyon from the northwest have little to no impact on elevated arsenic levels (City of Caliente, 2011). Groundwater in the eastern and southeastern area of the City of Caliente appears to be more influenced by the Clover Creek drainage than by the Meadow Valley Wash drainage (Thompson, 2011).

Potential for water quality contamination due to undercutting of the sewer line and gray water releases from the sewer plant during flood events are a threat to downstream users as well as wildlife and fisheries.

Executive Order 11998: Floodplain Management

EO 11988 requires federal agencies to take action to minimize occupancy and modification of floodplains. Furthermore, EO 11988 requires that federal agencies proposing to fund a project sited in the 100-year floodplain must consider alternatives to avoid adverse effects and incompatible development in the floodplain. FEMA's regulations implementing EO 11988 are codified at 44 CFR Part 9. FEMA has included in Appendix G the summary of the results of the 8-Step Decision-Making Process that was completed for the proposed project in compliance with EO11988.

Based on the FEMA Map Service Center's 2010 Lincoln County Flood Zone maps, a majority of the City of Caliente lies within a 100-year flood zone. The City of Caliente participates in FEMA's National Flood Insurance Program (NFIP). Thus the City of Caliente has promulgated and enforces a floodplain ordinance at least as stringent as the NFIP and its implementing regulations (44 CFR Parts 59 through 75). Furthermore, FEMA has published a Flood Insurance Rate Map (FIRM) for the City of Caliente.

The project area lies within floodway area zone AE. Any action that may be taken to resolve access issues during flood events would require construction within the floodway to provide access to the existing Nevada State owned Caliente Youth Center and control bank and streambed erosion.

4.3.1 *Alternative 1: No Project*

Under the No Project Alternative, flood events with annual exceedance probabilities of 0.1 to 0.2 or more (5- to 10-year events) would continue to affect stream morphology. The expectation is that annual maintenance would continue to be required and that less frequent flood events would result in access road closure or loss. In addition, there is risk to nearby critical structures, including the electric substation located adjacent to the project area.

Risk to the integrity of existing vicinity sewer and water mains would continue which potentially could have significant impacts on water quality.

The No Project Alternative would not achieve the project goals of eliminating flooding access issues for the Caliente Youth Center, increasing public health and safety for the residents and staff of Caliente Youth Center and the community as a whole, improving stream hydraulics, reducing flood hazards on critical infrastructure and reducing the financial cost of flood clean-up.

4.3.2 *Alternative 2: New Clear-Span Bridge*

There are no significant impacts to water resources and there would be a significant, long-term, positive impact on floodplain management.

The proposed 90-ft clear span bridge to replace the existing pair of culverts would provide sufficient conveyance to allow passage of flood events up to and including the one-percent annual exceedance frequency (100-year) event (Thompson, 2011). In addition, removal of the existing culverts would allow the stream system to move to a condition of dynamic equilibrium in which incoming sediment is passed through the reach without local aggradation similar to the condition present prior to original construction of the access road and culverts. The clear span structure would provide a barrier free stream flow and reduce the risk of debris dams that, in the recent past, have caused flooding to adjacent properties and adjacent infrastructure (sewer and water mains, electrical substation, roads, etc.).

To minimize adverse impacts to traffic and circulation during construction, the Subapplicant would provide a temporary low water crossing (graded road) and appropriate traffic control measures to ensure and retain access to CYC and the Caliente Hot Springs Hotel. To facilitate construction of these improvements, a temporary low-water crossing would be constructed with a culvert to convey normal channel flows beneath the temporary road through the duration of construction. Temporary BMPs to avoid water quality impacts during construction would be in place. The location of the temporary low water crossing is in an area that has been previously disturbed as a result of permitted streambed dredging on multiple occasions in the efforts to maintain flows in the creek. Upon completion, the temporary road and culvert would be removed and disturbed areas restored and revegetated prior to project completion as appropriate.

By its very nature, the bridge structure would be placed in the floodplain. The proposed project design is the minimum size necessary to safely provide ingress and egress to the Caliente Youth Center through the floodway.

The New Clear-Span Bridge Alternative would achieve all the project goals by completely removing the current impediments to flows of a 100-year flood event and thereby providing significant, long-term reduction in flooding access issues for the Caliente Youth Center, increasing public health and safety for the residents and staff of Caliente Youth Center and the community as a whole, improving stream hydraulics, reducing flood hazards on critical infrastructure and reducing the financial cost of flood clean-up.

4.3.3 *Alternative 3: Enlarged Concrete Arch Culverts*

Under this alternative there remains the potential to continue to have significant effects on water resources and floodplain management during 100-year flood events.

The Enlarged Concrete Arch Culverts Alternative would replace the existing undersized culverts with concrete arch culverts with sufficient capacity to pass flows from events up to the one-percent annual exceedance frequency (100-year). However, because this design does not provide a barrier free flow, there is potential higher risk, as in the No Project Alternative, for large woody debris to form a debris dam or for the accumulation of sediments in the upstream reach to reduce the culvert capacity and likely having the same results as the No Project Alternative.

This alternative would reduce flooding access issues for the Caliente Youth Center during minor flood events with annual exceedance probabilities of 0.1 to 0.2 or more (5- to 10- year events) resulting in short-term, minor improvements to public health and safety for the residents and staff of Caliente Youth Center and the community as a whole. There would also be short-term, minor improvements to stream hydraulics, reduction of flood hazards on critical infrastructure and reduction in the financial cost of flood clean-up.

In a large flood event, it is certain that debris will be transported down the creek and the debris load would be substantial. If this occurs, there is a great likelihood that additional debris and sediment would be trapped and the structure would fail hydraulically and perhaps physically as well. Therefore, there remains a major risk that flooding will overtop the road and prevent access to or from CYC and critical infrastructure will be damaged or destroyed.

4.4 Biological Resources

Vegetation

According to the United States Geological Survey (USGS) Southwest ReGap landcover classification system for Caliente and its surroundings (Entrix, 2010), the dominant plant communities that occur within the project area and immediately adjacent are classified as Inter-Mountain Basins Greasewood Flat, Mohave Mid-Elevation Mixed Desert and North American Warm Desert Wash. All of these communities are typical of the Mojave Desert Scrub Ecosystem.

The following is a description of the vegetation associations found within the project area and immediately adjacent.

Sagebrush/Perennial Grasses

Sagebrush and sagebrush/perennial grasses occur mainly in the northerly portion of Lincoln County in lowland steppes and valleys below 6,000 feet. This vegetation class includes shrubs such as rabbitbrush (Chrysothamnus spp.), bitterbrush (Purshia tridentate), cliffrose (Cowania mexicana) spiny hopsage (Grayia spinosa) and shadscale (Atriplex confertifolia).

Salt Desert Scrub

Salt desert scrub is commonly found on playas, in inter-mountain basins and in localized depressions where poorly draining loam soils develop into a desert pavement. This vegetation class is dominated by one or more shrub types such as shadscale, winterfat (Krascheninnikovia lanata), desert holy (Atriplex hymenelytra), budsage (Artemisia spinescens), fourwing saltbrush (Atriplex canescens). This plant association makes a patchy appearance around Caliente.

Lowland Riparian

The proposed project is located within a lowland riparian. In northern Lincoln County this is a common plant association along the Meadow Valley Wash and Clover Creek. Both drainages are intermittent, during normal precipitation years these drainages are dry in some reaches and flow year-round in others. Vegetation consists mainly of cottonwood-willow communities consisting of Fremont cottonwood (Populus fremontii), Gooding’s black willow (Salix gooddingii), coyote willow (Salix exigua), honey mesquite (Prosopis, glandulosa), screwbean mesquite (Prosopis pubescens), and desert willow (Chilopsis linearis). Non-native tamarisk and salt cedar (Tamarix spp.) has been introduced into this plant community as has species of Bromes (Bromus spp.).

Urban/Developed Lands

The Town of Caliente is classified as Urban/Developed Lands. The developed lands surrounding the project area include the CYC, parking lots, residential development, the town’s electrical substation and dirt roads that access the streambed. Youth Center Drive, currently using the culvert crossing of Clover Creek, provides two-way ingress and egress to both the CYC and the Caliente Hot Springs Hotel site. The abandoned Caliente and Pioche Railroad bridge crosses Clover Creek immediately below the project area and adjacent to the confluence of Clover Creek and Meadow Valley Wash. US Highway 93 crosses the riparian area below the confluence at less than 1000’ from the project area.

Sparsely vegetated are the stream banks within the project area immediately upstream and adjacent to the Clover Creek crossing. This is due to impacts created during flood events, post-flood bank stabilization efforts and on-going maintenance measures to remove accumulated sediments and other materials on the up-stream side of the culverts in attempt to keep the culverts barrier free. The stream banks below the Youth Center Street crossing have moderate vegetation cover.

Threatened and Endangered Species

Section 7 of the Endangered Species Act requires federal agencies to insure that any action authorized, funded or carried out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or modification of habitat of such species. To determine the potential for federally listed endangered, threatened, or candidate species or designated critical habitat to occur in the project area, the U.S. Fish and Wildlife Service (USFWS) list of federally listed species for Lincoln County, Nevada (USFWS, 2013) was reviewed. The following species are identified as Endangered (E), Threatened (T), or a Candidate Species (C) in Lincoln County:

Birds	Yellow-billed cuckoo (Coccyzus americanus)	C
	Southwestern willow flycatcher (Empidonax traillii extimus)	E
Fishes	chub (Gila robusta jordani)	E
	Big Spring spinedace (Lepidomeda mollispinis pratensis)	T
	Hiko White River springfish (Crenichthys baileyi grandis)	E
	White River Springfish (Crenichthys baileyi baileyi)	E
Flowering Plants	Ute ladies-tresses (Spiranthes diluvialis)	T
	Las Vegas buckwheat (Eriogonum corymbosum var. nilesii)	C
Reptiles	Desert tortoise (Gopherus agassizii)	T

Of the nine species listed above only the two bird species, the Yellow-billed cuckoo and Southwestern willow flycatcher, have any potential for occurring within or immediately adjacent to the project area. For all the other federally listed or candidate species, the project area is either (1) clearly outside of the known geographic or elevational range of the species or (2) does not contain habitat characteristics known to support the species or (3) habitat conditions and level of existing disturbances are too great, Because of the habitat potential for these two species biological surveys were conducted for both the Yellow-billed cuckoo and Southwestern willow flycatcher during the 2013 field season.

The habitat surrounding the project area contains a variety of willow species with a mixture of native broadleaf trees and shrubs with a diversity of age classes. With a distinct overstory it could be of suitable use by the Southwestern willow flycatcher. However, as the riparian corridor/habitat within the general vicinity is narrow, the suitability of the habitat is decreased for breeding but may be used during migration.

The riparian forest of cottonwoods and larger willows along the banks adjacent to the project area also provides suitable habitat for the Yellow-billed cuckoo with dense patches of cottonwood with a moderate to thick understory in close proximity of water. However, due to the relative small size of the patchy habitat the suitability is marginal at best.

Southwestern Willow Flycatcher

Surveys for Southwestern willow flycatcher were performed a total of four times during the months of May, June and July 2013. Survey dates in 2013 were as follows: May 31, June 25, June 30 and July 14th. A Recovery Permit was not issued by USFWS for surveying the area to protocol, therefore a passive survey methodology was used for all suitable habitat 1000 feet to the east of the proposed project up Clover Creek and also 1000 feet to the west along Meadow Valley Wash. Passive survey methodology included active aural and ocular searches of the riparian habitat along these two drainages. No recordings were broadcast into the habitat due to the lack of a Recovery Permit as the application was being processed by USFWS. The survey protocol for Southwestern willow flycatcher can be found in Appendix F. No Southwestern willow flycatcher was detected during the passive surveys performed over the four survey dates noted above. (Survey forms and the Survey Results Memo are located in Appendix F.)

Yellow-billed cuckoo

Surveys for Yellow-billed cuckoo were performed a total of three times during the months of June and July 2013. Survey dates in 2013 were as follows: June 25, June 30 and July 14th. The Draft Yellow-billed Cuckoo Survey and Monitoring Protocol for California (Laymon 1998) was utilized for the surveys. No Yellow-billed cuckoo were detected during protocol surveys. (Survey forms and the Survey Results Memo are located in Appendix F.)

A total of 35 other bird species were observed during protocol surveys (see Species List attached to the Survey Results Memo in Appendix F.) Breeding activity was also observed. One Yellow warbler nest (*Setophaga petechial*) was located in a cottonwood 15' off the ground on the southern bank of Clover Creek approximately 600 feet from the Youth Center Drive crossing. One Common yellowthroat (<u>Geothlypis</u> <u>trichus</u>) nest was located in Salix along the margins of Meadow Valley Wash south of the confluence. One American robin (*Turdus migratorius*) nest was located in a cottonwood on the north side of Clover Creek approximately 350 feet from the Youth Center Drive Crossing. A full list of wildlife species observed can be found in Appendix F.

FEMA initiated the informal consultation process with the U.S. Fish and Wildlife Service (USFW) required by Section 7 of the Endangered Species Act. The USFW responded in a letter dated September 19, 2013 (see Appendix F). Their response found that habitat occurring "in the action area may be used by Southwestem willow flycatchers and Yellow- billed cuckoos for foraging or migrating between April and September. As a result of project activities, foraging and migrating flycatchers and cuckoos may be displaced. However, effects to flycatchers and cuckoos as a result of displacement would be insignificant as there is sufficient nearby native vegetation that they can use for foraging or for cover."

USFW continued that, "Due to the temporary nature of impacts to potential flycatcher and cuckoo habitat and the lack of documented use of this area by flycatchers and cuckoos, the proposed action is not expected to result in a stress on resources, behavior, or nesting opportunities for the flycatcher. In addition effects to the species will be minimized because project activities would occur outside of the flycatcher and cuckoo breeding seasons. Effects to flycatchers and cuckoos as a result of displacement would be insignificant as there is sufficient nearby native vegetation that they can use for foraging or cover."

Based on the information documented in this Environmental Analysis, the limited operating period, and the proposed pre-construction migratory bird survey, the USFW concurs that the proposed project *may affect but is not likely to adversely affect* the southwestern willow flycatcher or yellow-billed cuckoo.

Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) (16 U.S.C. 701-711) was enacted in 1918 between the United States and Great Britain (representing Canada) and with Mexico in 1936, with Japan in 1972 and with the area previously known as the Union of Soviet Socialist Republics (USSR) in 1976. Virtually all birds found in the United States (with the exception of the domestic pigeon, European starling, house sparrow and certain species of upland game birds) are considered under the migratory bird definition. The MBTA established provisions regulating take, possession, transport and import of migratory birds, including their nests and eggs. The MBTA prohibits the take of migratory birds and does not include provisions for incidental take except for under a "Special Purpose Permit".

Riparian corridors provide critical habitat for breeding migratory birds. As is documented in the text above, three active nests of three different migratory bird species (Yellow warbler, Common yellowchat, and American robin) were observed within the area surveyed. Typically, species migrating to their breeding territories in North America will arrive late April, early May and fledge the young birds by the end of July.

Executive Order 11990: Protection of Wetlands

EO 11990 requires federal agencies to take action to minimize the destruction or modification of wetlands by considering both direct and indirect impacts to wetlands. Furthermore, EO 11990 requires that federal agencies proposing to fund a project that could adversely affect wetlands must consider alternatives to avoid such effects wherever there is a practicable alternative. FEMA's regulations implementing EO 11990 are codified at 44 CFR Part 9.

Currently the conditions of the Clover Creek are aggravated by the continued bank erosion, sediment aggregation, and dredging within the channel. These conditions prevent naturally occurring wetland species from establishing along the stream banks and streambed creating significantly degraded conditions. There are no identified wetlands within the project area based on the U.S. Fish and Wildlife Service's Wetland Inventory Maps. The Meadow Valley Wash between Caliente and Elgin has been identified as a high priority wetland in the Nevada Division of Environmental Protection's

Statewide Wetland Prioritization Inventory. However, there was no mapping documentation involved with this inventory project. The NEPA Environmental Assessment (EA) analysis prepared by FEMA for the proposed project has identified the project area as potential wetlands for the purpose of the EA.

Stream crossing projects by their very nature are implemented within areas of perennial or ephemeral surface flows and high ground water which sustains vegetation associated with wetlands. The Clover Creek bridge crossing and associated project elements are not within an identified wetland; however, the alternatives to the CYC access issues over Clover Creek involve both the streambed and riparian corridor. There is no practicable alternative to the stream crossing that would provide the continued safe ingress and egress to the Caliente Youth Center, reduce flood risks, and provide the opportunity to restore hydrologic/hydraulic processes within this reach.

Executive Order 13112: Invasive Species

EO 13112 requires federal agencies to prevent the introduction of invasive species and to provide for their control and minimize the economic, ecological, and human health impacts that invasive species cause. Under this order, the federal government may not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species in the United States unless, pursuant to the guidelines that it has prescribed, the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species and all feasible and prudent measures to minimize risk of harm would be taken in conjunction with the actions.

Both the New Clear-Span Bridge Alternative and the Enlarged Concrete Arch Culvert Alternative propose to stabilize the banks and revegetate with native plants appropriate for the areas disturbed by construction within and immediate to the project area. In addition, all materials to be used in the stabilization, revegetation and mulching of disturbed areas would be certified weed free.

FEMA has complied with USFWS consultation requirements (see Appendix F for FEMA's letter to USFWS) regarding this project. USFWS comments will be incorporated and implemented with the project as appropriate in order to make a finding of not likely to effect.

4.4.1 *Alternative 1: No Project*

Under the No Project Alternative, no impacts would occur to biological resources due to construction or other activities that could potentially disturb these resources.

However, under the No Project Alternative, there is no opportunity to stabilize the stream banks and to move the stream channel to a more natural dynamic equilibrium that might allow for a more natural bed load that would not need frequent dredging to maintain flow capacity. The No Project Alternative would provide no opportunity to improve riparian conditions or re-establish native vegetation. The No Project Alternative would not achieve the project goals of eliminating flooding access issues for the Caliente Youth Center, increasing public health and safety for the residents and staff of Caliente Youth Center and the community as a whole, improving stream hydraulics, reducing flood hazards on critical infrastructure and reducing the financial cost of flood clean-up.

4.4.2 *Alternative 2: New Clear-Span Bridge*

Implementation of Alternative #2 for the New Clear-Span Bridge Alternative would require the removal of vegetation from the stream banks up-stream and down-stream of the Youth Center Drive creek crossing. Temporary BMP mitigation measures would be employed during project implementation to protect native riparian vegetation outside of areas needed for construction. These measures can include individual tree protection, vegetation protective fencing, the identification of construction material storage locations, and identified parking areas outside of vegetated areas depending on site specific variables. Permanent BMPs include the revegetation of previously vegetated areas with native species appropriate for the location and the application of a mulch layer on other disturbed areas due to construction. Both seed and mulch mixes would be certified weed free.

Based on informal consultation with the USFW it has been determined that the proposed project *may affect but is not likely to adversely affect* the southwestern willow flycatcher or yellow-billed cuckoo.

The proposed project would have no impact on migratory birds that may utilize the riparian habitat within or adjacent to the project area. The proposed project design identifies the project construction window to be limited to an August start and no construction proposed between April and July. The construction window serves two purposes; assures low flow/dryer stream bed conditions and avoids the migratory breeding season. A pre-construction migratory bird survey will be conducted to insure impacts to migratory birds are avoided.

The proposed project would result in improvements to the riparian habitat and is not likely to adversely affect any wetland. The removal of the two pipe culverts in the stream bed and replacement with a clear-span bridge would insure unencumbered flow of Clover Creek. It would also significantly reduce the long term seasonal need to dredge the creek bed to remove accumulated materials that block flow passage through the existing culverts. One of the proposed project's design goals is to return hydrologic and hydraulic actions to a condition that allows for this portion of Clover Creek to move toward a more natural dynamic equilibrium. In turn, this would allow the riparian corridor in this reach to self-repair with time.

The proposed project would not have a negative impact on the management of invasive species. The revegetation efforts would employ native plant species that are appropriate for the locations to be revegetated and would include only materials (rock, seed, mulch, etc.) that have been certified weed-free to prevent the introduction of invasive species.

The New Clear-Span Bridge Alternative would achieve all the project goals by completely removing the current impediments to flows of a 100-year flood event. The clear-span bridge would positively affect the ability of Clover Creek through the project area reach to move towards natural stream hydraulics reducing both streambed and bank erosion allowing the reestablishment of riparian vegetation. This alternative would provide significant, long-term reduction in flooding access issues for the Caliente Youth Center, increase public health and safety for the residents and staff of Caliente Youth Center and the community as a whole, improve stream hydraulics, reduce flood hazards on critical infrastructure and reducing the financial cost of flood clean-up.

Though there would be short-term construction effects to biological resources due to the vegetation removal, the construction of the temporary low-water crossing to accommodate continued access during construction, dredging necessary to install the grade control structure and streambank stabilization the New Clear-Span Bridge Alternative is not likely to affect biological resources long-term.

4.4.3 *Alternative 3: Enlarged Concrete Arch Culverts*

Implementation of this alternative would result in impacts similar to the New Clear-Span Bridge Alternative as described in 4.4.2.

However, the replacement of the existing culverts with new culverts sized to accommodate 100-year event flows would not create a clear span for woody debris and other materials carried by high flow conditions. Similar to the No Project Alternative, materials would accumulate on the up-stream side of the culverts creating debris dams and flood risks, further eroding stream banks and impacting riparian habitat.

This alternative would reduce flooding access issues for the Caliente Youth Center during minor flood events with annual exceedance probabilities of 0.1 to 0.2 or more (5- to 10-year events) resulting in short-term, minor improvements to public health and safety for the residents and staff of Caliente Youth Center and the community as a whole. There would also be short-term, minor improvements to stream hydraulics, reduction of flood hazards on critical infrastructure and reduction in the financial cost of flood clean-up.

However, in a large flood event, it is certain that debris will be transported down the creek and the debris load would be substantial. If this occurs, there is a great likelihood that additional debris and sediment would be trapped and the structure would fail hydraulically and perhaps physically as well. Therefore, there remains a major risk that flooding will overtop the road and prevent access to or from CYC and critical infrastructure will be damaged or destroyed.

4.5 Historic Properties and Archaeological Resources

The recorded history of Caliente documents ranching as the predominate mainstay for the area surrounding the town of Caliente in the early years. A number of ranches were established in this area originally known as Dutch Flat (named after the Dutch Flat Ranch, established in 1857). In 1874 William and Charles Culverwell started to acquire land that would eventually become the Culverwell Ranch by 1879. Dutch Flat became known as Culverwell. In the late 1890s, the Union Pacific Railroad (UPRR) and the San Pedro, Los Angeles and Salt Lake Railroad Company competed for land to complete a railway from Salt Lake City to Los Angeles that ran through Culverwell, including a stretch of Meadow Valley Wash. “Clover Junction” was the name given to the site in 1901 where the rail line would intersect another branch heading north to Pioche. When hot springs were discovered on the Culverwell Ranch property (not far from the junction site) the name was changed to “Calientes” and then “Caliente” in 1903.

Charles Culverwell built a hotel (the Culverwell Hotel) in anticipation of the completed rail line and the hot springs’ attraction to tourists. The expectation of becoming a tourist destination by rail line did not pan out. However, the Town of Caliente did become a major stopping point between Las Vegas and Salt Lake City for the trains to be maintained and the crews to be switched. The railroad industry created a boom for the town creating the need for hotels, saloons, construction of homes and other businesses to support the growing population. In 1907 and 1910 floods destroyed the rail line. But, each time the line was rebuilt. The Town of Caliente prospered and grew to a population of approximately 5,000 (Town of Caliente, 2011).

In the 1940s, there were two events that affected the Town of Caliente and its dependence on the railroad as its main economic driver. U.S. 93 was built which meant shipments could be carried by trucks rather than train and steam engines were replaced by diesel locomotives with the division point moving to Las Vegas.

Section 106 of the National Historic Preservation Act (NHPA) requires federal agencies to take into account the effects of their undertakings on historic properties and afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on such undertakings. A Class III cultural resources inventory of approximately 6.2 acres and an assessment of the historic railroad bridge immediately downstream from the project area was completed on May 25, 2013. The survey area and the bridge lie at the north end of Caliente, encompassing a portion of Clover Creek and the entrances to the Caliente Youth Center and the Caliente Hot Springs Motel. No historic properties potentially eligible to the National Register of Historic Places (NRHP) were located during the survey.

The inventory resulted in the identification of one highly disturbed archaeological site (temporarily designated CYC-MG-1) consisting of historic refuse dating between ca. 1900 and 1960 (see Appendix E for full report). The site contains a wide variety of domestic refuse (e.g., bottle glass shards, earthenware ceramic sherds and porcelain sherds, pieces of unidentified metal, ceramic sewer pipe, wire, milled wood, chunks of concrete, sanitary cans, bits of ceramic insulator, cut faunal bone) and appears to represent mixed debris from sediment that is regularly removed from Clover Creek during permitted post-flood dredging activities.

The C&P Railroad bridge lies outside the project area and will not be affected directly or indirectly by the project. The railroad bridge was formerly a feature of the Caliente and Pioche (C & P) Railroad, a branch of the UPRR's Salt Lake Route. Built in 1911, it is a common pony, thru-truss, plate-girder steel bridge. The bridge is supported by an abutment of vertical wooden pilings capped with a stacked beam-and-tie platform. The bridge remains unevaluated for NRHP as it does not stand to be impacted in any way by the proposed flood mitigation project.

In accordance with Section 106 of the National Historic Preservation Act (NHPA), and its implementing regulations found in 36 Code of Federal Regulations, Part 800 (36 CFR

800), and considering 36 CFR 60.4, archaeological site CYC-MG-1 was evaluated with respect to their eligibility for listing to the National Register of Historic Places (NRHP).

Site CYC-MG-1 is in tertiary depositional context, has a temporally mixed cultural assemblage, of highly fragmented artifacts. The site is not associated with significant historic events (NRHP Criterion A) or persons of importance in history (NRHP Criterion B). It does not embody the distinctive characteristics of a type, period, or method of construction (NRHP Criterion C), and cannot offer any useful scientific data regarding historic occupations in Caliente (NRHP Criterion D). This site is thus recommended not eligible for NRHP listing under any evaluation criteria.

In accordance with Section 106 of the National Historic Preservation Act, FEMA has complied with consultation requirements with both the Nevada State Historic Preservation Office and the Native American Tribes of eastern Nevada and western Utah (see Appendix E for FEMA's letters to NVSHPO and surrounding applicable Native American Tribes) regarding this project. In a letter to FEMA dated January 3, 2014, SHPO concurs with FEMA's above determination (see Appendix E for SHPO's letter to FEMA). All received comments will be incorporated and implemented with the project as appropriate in order to make a finding of no historic properties affected.

4.5.1 *Alternative 1: No Project*

Under the No Project Alternative, no impacts would occur to historic properties and archaeological resources because no construction or other activities would occur that could potentially disturb them.

The No Project Alternative would not achieve the project goals of eliminating flooding access issues for the Caliente Youth Center, increasing public health and safety for the residents and staff of Caliente Youth Center and the community, improving stream hydraulics, reducing flood hazards on critical infrastructure and reducing the financial cost of flood clean-up.

4.5.2 *Alternative 2: New Clear-Span Bridge*

Based on the results of the record search, the Class III cultural resources inventory, the historic architectural assessment, and the finding of no significant cultural or historic resources it has been determined that the proposed project would not affect any historic properties or archaeological resources.

Should any previously unidentified prehistoric or any historic properties be encountered during the construction process, the Subapplicant would cease all construction activities in the vicinity of the discovery and will take all reasonable measures to avoid or minimize harm to the property. The Subapplicant must notify NDEM, and NDEM must notify FEMA as soon as practicable. FEMA will then consult with the NVSHPO. In the case of the discovery of human remains, the SPWD shall immediately notify the local law enforcement office and the county coroner/medical examiner. If the coroner/examiner determines that human remains are or may be of Native American origin, the discovery would be treated in accordance with Nevada Revised Statute 383.

4.5.3 *Alternative 3: Enlarged Concrete Arch Culverts*

Implementation of Alternative 3 would result in impacts similar to the proposed project as described in 4.5.2.

4.6 Socioeconomics and Safety

Potential changes to socioeconomic resources include changes to demographics, housing, employment, the local economy, and public safety.

According to the 2010 Census and 2007-2011 American Community Survey for Caliente City, Nevada (U.S. Department of Commerce Census Bureau 2013), the population of the City of Caliente is 1,130, which is 4.18% of the population of Nevada (2,700,551). The Census indicates that 52.4% of the City population is male, and 84.5% of the population consider itself one race and white. The median age is 30.6 years, with 39.0% of the City population aged 16 or older, and 51.7% of this age group in the labor force. The major industries for the employed population are educational services, and health care and social assistance (24.9%), and public administration (17.5%). The major occupations are service occupations (38.4%), and management, business, science, and arts occupations (25.5%).

There are 551 housing units in the City and the average household size is 2.57 people. The median household income is $28,661 and the median home cost is $130,300. Between 2000 and 2004, 27 homes were built. Almost three-quarters of the homes in the City (403 or 73.1%) were built prior to 1970. Three hundred fourteen (56.9%) of the housing units are detached, one-unit structures. Sixty (14.9%) of the households have no vehicles.

Environmental Justice

EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, was signed on February 11, 1994. The EO directs federal agencies to make achieving environmental justice part of their missions by identifying and addressing, as appropriate, disproportionately high adverse human health, environmental, economic, and social effects of its programs, policies, and activities on minority and low-income populations.

Socioeconomic and demographic data for residents in the project vicinity were studied to determine if a disproportionate number (defined as greater than 50 percent) of minority or low-income persons have the potential to be affected by the proposed alternatives. A comparison of relevant environmental justice indicators is shown in Table 2. Review of these indicators was based on county-wide and city-wide information.

Table 2 indicates that the proposed project area does not have a majority of minority persons, low-income persons, disabled persons, elderly persons, or persons with limited English-speaking ability. However, the Census data does not account for the 140 “at-risk youth” committed to the care of the Nevada State Division of Child and Family Services at CYC.

Table 2 - Socioeconomic Factors

Indicator	Lincoln County	City of Caliente
Total Population	5,345	1,130
Nonwhite Persons	474	175
Persons of Hispanic Origin	332	100
Person Over Age 5 who Speak English “Less Than Very Well”	29	14
Persons Aged 65 years and over	18.1%	17.9 %
Disabled Persons	X	X
Persons in Households with Public Assistance Income	186	50
Families with Income Below Poverty Level	13.1%	20.7%

Public Safety

The Caliente Youth Center (CYC) is located in Caliente, Nevada. The facility provides correctional care for as many as 140 children committed to the care of the Nevada State Division of Child and Family Services. The staff-secure facility has 7-housing units, five units for males and two for females age 12-18. The CYC is the only state-operated correctional facility for females. This center, along with the Lincoln County School District, operates rehabilitative and educational programs that offer required and elective academic subjects, remedial programs, special education, vocational education and interscholastic activities. In addition, the CYC employs as many as 100 state personnel.

Youth Center Drive is the single point of access to both the CYC facility and the Hot Springs Motel. The road crosses Clover Creek near the confluence of Clover Creek and Meadow Valley Wash. The crossing comprises two, twelve-foot pipe culverts and a concrete headwall. While these culverts provide sufficient capacity for relatively frequent events, they are significantly undersized for severe flood events.

A flood event in January 2005 jeopardized the safety of residents and staff by preventing CYC relief staff and emergency vehicles access to the CYC facility for evacuation of residents and staff and by creating the potential for flooding of adjacent CYC structures. Flows emanating from the Clover Creek watershed exceeded culvert capacity and overtopped the roadway to a depth of three to five feet. Concern for the rising floodwaters resulted in an air evacuation of the residing children and CYC staff using Blackhawk helicopters dispatched from Nellis Air Force Base. During the 2005 event, significant flooding occurred further downstream through the community and resulted in damage to homes, roads, businesses, and utilities. Damages exceeded $856,656 and included the destruction of the City's municipal drinking well.

Following the 2005 flood event, the City of Caliente diligently labored to excavate six to eight feet of accumulated sediment from the culverts. When the December 21, 2010 flood event occurred, City personnel immediately initiated debris removal efforts in an attempt to maintain culvert conveyance until it was no longer safe to continue these operations. The backwater and debris from this event resulted in severe erosion along the south bank immediately upstream from the culverts, and threatened the electrical substation that supplies power to the entire community. The streambank, which was originally approximately 15 feet from the electrical substation, eroded to within 3 feet of the substation. A declaration of emergency was initiated by the City, the County and State, and private contractors were mobilized to reinforce the rapidly-deteriorating bank with rock reinforcement. Because of the previous maintenance efforts and the City's quick response to debris removal, the substation and access road were saved. Damages associated with this event were $135,830.

Repeated flooding of the access road because of reduced culvert conveyance remains a problem. Because of accumulated sediments, the culverts under the CYC access road now have only 1.5 to 2.0 feet of free opening (out of 12 feet). If this crossing is not removed and replaced with an improved structure, the access road and surrounding improvements remain at risk of flood inundation from relatively frequent hydrologic events. Additionally, critical infrastructure is at risk with the electrical substation being in close proximity to the channel and sewer and water infrastructure being located under the roadway but above the existing culvert. If the access road is damaged during a future flood event, it is likely both the sewer and water infrastructure will be destroyed. Therefore, action is required to reduce flooding hazards and provide protection for the population and both public and private property within the Clover Creek watershed in the City of Caliente.

4.6.1 *Alternative 1: No Project*

Environmental Justice

Under the No Project Alternative, continued sedimentation could lead to bank instability in and around the bridge, damages to the roadway and water and sewer infrastructure, flooding of the CYC buildings, and damages to the electrical substation. The No Project Alternative could have an adverse effect on the unrepresented at-risk youth residing at the CYC.

Public Safety

Under the No Project Alternative, recurrent flooding jeopardizes the safety of residents and staff by eliminating emergency vehicle access for evacuation of the CYC facility and creates the potential for flooding of adjacent CYC structures. Due to erosive forces during flood events, water and sewer infrastructure which serves CYC is at risk in its current location under the roadway above the existing culverts. If the access road is damaged during a future flood event, it is likely both the sewer and water infrastructure will be destroyed. The loss of use for water and sewer would affect the Caliente Youth Center and Caliente Hot Springs Motel.

Additionally, the No Project Alternative could potentially result in destruction of the power substation. Severe erosion along the south bank immediately upstream of the culverts threatens the electrical substation that supplies power to the entire community. Damage to the electrical substation would result in loss of power for the entire City of Caliente ranging from several hours to several weeks and potentially undermine sewer and water mains.

4.6.2 *Alternative 2: New Clear-Span Bridge*

Environmental Justice

As described above, most of the project vicinity does not have a disproportionate number of minority, low-income, disabled, or elderly persons, or persons with limited English-speaking ability according to the U.S. Census. However, some of the at-risk students residing at CYC fall under these categories and are not accounted for. Most impacts from the proposed project would be beneficial. The implementation of the proposed project would provide a limited number of job opportunities to the community through the use of local construction workers. Therefore, the federally funded project would not cause disproportionately high adverse human health, environmental, economic, or social effects on minority populations and would be in compliance with EO 12898.

Public Safety

Implementation of the proposed project would significantly improve conveyance of flood flows under Youth Center Drive and reduce the risk of the road overtopping. Additionally, this project would reduce the need for emergency evacuation of CYC and loss of use of CYC when the road is flooded. The grade control structure would reduce sediment transportation downstream and the bank stabilization would reduce the risk of flood damages to the water and sewer infrastructure and the electrical substation. The proposed project would have a positive impact on public safety. During construction, traffic control measures would be installed and maintained to ensure and retain access to CYC during construction. This would be in the form of a temporary low water crossing.

4.6.3 *Alternative 3: Enlarged Concrete Arch Culverts*

Environmental Justice

Under Alternative 3, impacts to socioeconomics would be similar to those described under Alternative 2 or New Clear-Span Bridge Alternative.

Public Safety

Implementation of Alternative 3 would improve conveyance of flood flows under Youth Center Drive and reduce the risk of the road overtopping during minor flood events. Additionally, this alternative would reduce the need for emergency evacuation of CYC and loss of use of CYC when the road is flooded. The grade control structure would reduce sediment transportation downstream and the bank stabilization would reduce the risk of flood damages to the water and sewer infrastructure and the electrical substation. Alternative 3 would have a positive impact on public safety during minor flood events. During construction, traffic control measures would be installed and maintained to ensure and retain access to CYC during construction. This would be in the form of a temporary low water crossing.

However, in a large flood event, it is certain that debris will be transported down the creek and the debris load would be substantial. If this occurs, there is a great likelihood that additional debris and sediment would be trapped and the structure would fail hydraulically and perhaps physically as well. Therefore, there remains a major risk that flooding will overtop the road and prevent access to or from CYC which jeopardizes the safety of residents and staff by eliminating emergency vehicle access for evacuation of the CYC facility and creates the potential for flooding of adjacent CYC structures. Due to erosive forces during flood events, water and sewer infrastructure which serves CYC is at risk in its current location under the roadway above the existing culverts. If the access road is damaged during a future flood event, it is likely both the sewer and water infrastructure will be destroyed. The loss of use for water and sewer would affect the Caliente Youth Center and Caliente Hot Springs Motel.

Additionally, this alternative could potentially result in destruction of the power substation. Severe erosion along the south bank immediately upstream of the culverts threatens the electrical substation that supplies power to the entire community. Damage to the electrical substation would result in loss of power for the entire City of Caliente ranging from several hours to several weeks and potentially undermine sewer and water mains.

4.7 Land Use and Planning

This resource category involves the evaluation of land uses and land ownership in the area where the action would take place. Impacts can occur if the proposed project changes real or designated use areas or causes imbalanced land use.

Caliente is the only incorporated city in Lincoln County. The majority of the land use in the area is a mix of low density residential, potential open space, office and industrial (City of Caliente, 2011). Housing along Spring Street is located within 300 yards of the project site. The project area is owned and maintained by the State of Nevada.

Because the project site is located in Clover Creek, permitting through the U.S. Army Corps of Engineers would be required. The final design documents would also be reviewed and/or permitted by the USFW, SPWD, Nevada Division of State Lands, Lincoln County, City of Caliente, and Lincoln County Power District #1. The State of Nevada would ensure that all government land use laws and regulations are met.

4.7.1 *Alternative 1: No Project*

Because no new facilities would be built and no existing facilities would be modified, the No Project Alternative would not affect land use.

4.7.2 *Alternative 2: New Clear-Span Bridge*

The proposed project, which includes excavation, construction, and staging that would occur on land held by the State of Nevada. No changes in land ownership would occur, and no formal easements or land transfers would be necessary. Implementation of the proposed project would not modify existing land use in or around the project area. The State of Nevada would be responsible for applying for and obtaining all required permitting and approval.

4.7.3 *Alternative 3: Enlarged Concrete Arch Culverts*

Alternative 3, which includes excavation, construction, and staging, would occur on land held by the State of Nevada. No changes in land ownership would occur, and no formal easements or land transfers would be necessary. Implementation of the proposed project would not modify existing land use in or around the project area. The State of Nevada would be responsible for applying for and obtaining all required permitting and approval.

4.8 Transportation

U.S. Route 93 is an arterial road through the City of Caliente and the primary access to Las Vegas to the south and Ely to the north. Youth Center Drive is a local street maintained by the State of Nevada which provides ingress and egress to the Caliente Youth Center as well as the Hot Springs Motel and residential and commercial properties to the south of the project site, is connected directly to U.S. Route 93. Average daily trips on U.S. Route 93 total 2,100 (NDOT, 2013), while average daily trips on Youth Center Drive over the bridge total 75 (NDOT, 2010).

4.8.1 *Alternative 1: No Project*

There would be potential significant adverse effects to transportation infrastructure within the vicinity due to the existing flow capacity of the two culverts and the structural impediment they present during a flood event. Recurrent flooding jeopardizes the safety of CYC residents and staff by preventing relief staff and emergency vehicles access to the CYC facility and creates the potential for flooding of adjacent CYC structures. When flows overtop the road by three to five feet, the only means to access the CYC facility for CYC relief staff, medical emergencies or to evacuate residing children and CYC staff is by air, thus the No Project Alternative would result in long-term adverse impacts.

4.8.2 *Alternative 2: New Clear-Span Bridge*

The New Clear-Span Bridge Alternative would increase the conveyance and capacity for flood flows under Youth Center Drive resulting in reduced risk for overtopping of the road, damage to the roadway, and impacts due to roadway closures.

Implementation of the proposed project would result in short term, minor impacts to transportation for the Caliente Youth Center and Caliente Hot Springs Motel during construction. Other commercial and residential properties to the south access their properties before the crossing of Clover Creek. However, they may experience traffic congestion and inconvenience of construction equipment in the area. U.S. Route 93 is a major highway and an arterial route through the City of Caliente. The small addition of construction vehicle traffic associated with the proposed project would be negligible due to the limited operating period of construction (120 days), as well as an estimate of 10 construction vehicle trips per day.

To minimize adverse impacts to traffic and circulation during construction, the Subapplicant would provide a temporary low water crossing and appropriate traffic control measures to ensure and retain access to CYC and the hotel during construction. To facilitate construction of these improvements, a temporary graded road would be constructed with a culvert to convey normal channel flows beneath the temporary road through the duration of construction. Temporary BMPs to avoid water quality impacts during construction would be in place. The location of the temporary low water crossing is in area that has been previously disturbed by permitted dredging on multiple occasions in the efforts to maintain flows in the creek. Upon completion, the temporary road and culvert would be removed and disturbed areas scarified and/or revegetated prior to project completion with certified weed-free materials.

4.8.3 *Alternative 3: Enlarged Concrete Arch Culverts*

Similar to Alternative 2, Alternative 3 would increase the conveyance and capacity for flood flows under Youth Center Drive during minor flood events resulting in short-term reduced risk for overtopping of the road, damage to the roadway, and impacts due to roadway closures.

However, the design would still present a barrier to large woody debris with the potential of blocking the passage of flood waters and the accumulation of sediment and bank scouring during a 100- year flood event. In a large flood event, it is certain that debris will be transported down the creek and the debris load would be substantial. If this occurs, there is a great likelihood that additional debris and sediment would be trapped and the structure would fail hydraulically and perhaps physically as well. Therefore, there remains a major risk that flooding will overtop the road and jeopardize the safety of residents and staff by eliminating emergency vehicle access for evacuation of the CYC facility and creates the potential for flooding of adjacent CYC structures.

Implementation of Alternative 3 would result in temporary, minor impacts to transportation during construction, as described in Section 4.8.2. Subapplicant would be required to implement the same mitigation measure as discussed in Section 4.8.2.

4.9 Noise

Certain land uses are sensitive to noise. Noise-sensitive receptors are located at land uses associated with indoor and/or outdoor activities that may be subject to stress or significant interference from noise. They often include residential dwellings, hotels, hospitals, nursing homes, educational facilities, libraries, and offices. The nearest residence to the project site is approximately 300 yards away and is separated from the creek by commercial property owned by Thomas Petroleum. Noise sources in the project area include the industrial traffic from Thomas Petroleum, highway traffic along U.S. Route 93, and vehicle traffic along Hot Springs Road and Harriman Parkway.

4.9.1 *Alternative 1: No Project*

Under the No Project Alternative, noise would remain at current levels. However, none of the project goals are achieved under this alternative.

4.9.2 *Alternative 2: New Clear-Span Bridge*

Construction noise is unavoidable and could adversely affect nearby residents. However, construction noise would be temporary and limited to the duration of project construction, which is 120 days. The combination of noise-producing equipment that would be in use during any particular period is difficult to predict. However, noise levels from construction activity during various phases of similar construction projects have been evaluated and their use yields an acceptable prediction of the project's potential noise impacts. Based on USEPA (1971) data of similar public works projects, average noise levels generated by the proposed project are estimated to be 88 decibels A-weighted (dBA) Leq (the energy-averaged noise level) at a distance of 50 feet. Noise levels of this magnitude, although temporary, would be readily audible and would dominate the noise environment in the area during construction operations. Typically, the magnitude of construction noise emission varies over time because construction activity is intermittent and power demands on construction equipment (and the resulting noise output) are cyclical.

Noise levels generated at any point source decrease at a rate of approximately 6 decibels per doubling of distance away from the source (Diehl 1973). Therefore, noise levels would be 82 dBA at 100 feet from the center of construction activity, 76 dBA at 200 feet, and 70 dBA at 400 feet. This calculated reduction in noise level is based only on losses resulting from spreading of the sound wave as it leaves the source and travels outward. Shielding, such as buildings, that block the line of sight would attain an additional 5 dBA or more reduction.

The Subapplicant would be responsible for implementing the following measures to reduce noise levels and their effects to the extent practicable:

- All mobile or fixed noise-producing construction equipment that is regulated for noise output by a local, state, or federal agency would comply with such regulation.

- The use of noise-producing signals, including horns, whistles, alarms, and bells, would be for safety warning purposes only.
- Construction would be limited to weekdays between 7 a.m. and 7 p.m. and between 10 a.m. and 5 p.m. on weekends.
- Noise levels resulting from construction would comply with local noise ordinances.

4.9.3 *Alternative 3: Enlarged Concrete Arch Culverts*

Under Alternative 3, the construction noise would be the same as the proposed project as discussed in Section 4.9.2. The Subapplicant would be responsible for implementing the same measures to reduce noise levels and their effects to the extent practicable.

4.10 Visual Resources

The City of Caliente is surrounded by steep slopes that create dramatic foothill backdrops establishing the character of Caliente's landscape that is valued by its citizens, visitors, and businesses. Much of Caliente is located in the Meadow Valley Wash floodplain and is physically constrained by the steep slopes and the Meadow Valley Wash floodway. Clover Creek enters the community from the east and has its confluence with Meadow Valley Wash at the Union Pacific Railroad bridge located near the proposed project site.

The project is located within a riparian corridor. Riparian vegetation, as described in Section 4.4, grows sparsely along the stream banks within the project area immediately upstream and adjacent to the Clover Creek crossing. This is due to impacts created during flood events, post-flood bank stabilization efforts and on-going maintenance dredging measures to remove accumulated sediments and other materials on the up-stream side of the culverts in attempt to keep the culverts barrier free. The stream banks below the Youth Center Drive crossing have moderate vegetation cover.

The bed of Clover Creek is broad and is entirely covered with recently and frequently deposited silt and sand. All unpaved ground surfaces elsewhere in the project area have been graded and consist of fill material used in road building and in the construction of a transformer pad positioned above the south edge of Clover Creek.

The existing visual character of the stream course is extremely degraded due to annual and periodic dredging and the visual interruption of the stream course due to the existing culverts and roadbed. There are no specific mapped or identified scenic resources within the project area and this project does not occur on lands required to be evaluated under federal visual quality management standards. However, typical of most visual or scenic quality management systems is the identification of riparian and stream resources as having high scenic value. This is due to the contrast that is presented against the surrounding backdrop and is especially unique in dryer landscapes such as those found in Lincoln County. Views of water, stream course and vegetated stream banks can contribute to high visual quality ratings.

Currently there are views of the project area from existing development above and below Youth Center Drive and from the bridge at U.S. Highway 93 looking east. Currently through views of the stream course are blocked by the existing culverts and Youth Center Drive.

4.10.1 *Alternative 1: No Project*

Under the No Action Alternative, the areas would continue to be extremely susceptible to flooding. Visual resources such as the riparian vegetation would be adversely impacted during flood events. No impacts would occur to existing visual resources and there would be no opportunity to make significant visual quality improvements as long as the culverts remained. The No Project Alternative would neither improve visual quality or achieve the project goals of eliminating flooding access issues for the Caliente Youth Center, increasing public health and safety for the residents and staff of Caliente Youth Center and the community as a whole, improving stream hydraulics, reducing flood hazards on critical infrastructure and reducing the financial cost of flood clean-up.

4.10.2 *Alternative 2: New Clear-Span Bridge*

Implementation of the New Clear-Span Bridge Alternative would have short term effects on scenic resources during construction of the bridge, grade control structure and slope stabilization. Long term, this alternative would have a positive effect on scenic resources. The removal of the culverts and replacement with a clear-span bridge will provide an unencumbered view of the restored streambed and, with the exception of the bridge structure crossing, an uninterrupted view of the stream course. Stabilization of the project area stream banks will allow for establishment of native vegetation increasing visual diversity and contrast.

The Subapplicant would be responsible for revegetating and contouring finished surfaces to blend with adjacent natural terrain to achieve a natural appearance when the project is complete.

4.10.3 *Alternative 3: Enlarged Concrete Arch Culverts*

Alternative 3 would have a temporary effect on the character of the setting. During construction, existing vegetation, rock, and debris would be removed from the channel and immediately surrounding areas, and construction activities would be visible from nearby residences, the Caliente Youth Center, the Hot Springs Motel, and roads.

Implementation of Alternative 3 would not substantially increase scenic resource values through this reach due to the installation of larger culverts. The culverts still present an impediment to an uninterrupted view of the streambed and stream course. .

The Subapplicant would be responsible revegetating and contouring finished surfaces to blend with adjacent natural terrain to achieve a natural appearance when the project is complete.

4.11 Cumulative Impacts

The Council for Environmental Quality (CEQ) defines a cumulative impact as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions…" (40 CFR Part 1508.7). The proposed project would remove the two pipe culverts that do not currently have the design capacity to carry flood waters generated from a 100- year flood event. The proposed bridge design provides clearance for such an event and greatly reduces the risk of cutting off access to the Caliente Youth Center during a flood event; thereby, reducing risks to human health and safety over existing conditions.

Based on the above analysis, the project design "pre-mitigates" all potential impacts. Integral to the project design are BMP and mitigation measures that when implemented will avoid any impacts to water quality, soil conservation, air quality, biological resources, cultural resources and noise. There would be no cumulative impacts to any of the resource elements.

The bridge proposed to replace the culvert crossing maintains access to the CYC and the Caliente Hot Springs Motel and does not increase access opportunities or capacities, there are no growth inducing influences.

The City of Caliente is in receipt of a grant to remediate Spring Heights flooding through a hazards mitigation grant. The Spring Heights project will be constructed approximately one half mile from the proposed project and will direct captured storm water into the City's underground sewer system. The completed project would control and route flash floods generated from the drainage basin upstream and mitigate future damage to private property and public infrastructure. It is not anticipated that this project's construction schedule would overlap with the Youth Center Bridge project. The Spring Heights project is likely to initiate construction in 2015. Together, once constructed, these projects will have an incremental cumulative positive impact on reducing flood affects in the Caliente area.

The City of Caliente, the CYC and Lincoln County are unaware of any other plans for additional construction in the project area during the construction period for the proposed project. Therefore, no cumulative impacts are expected to occur from the proposed project in combination with actions occurring in the vicinity of the project area currently or within the foreseeable future.

5 Irreversible or Irretrievable Commitment of Resources

5.1 Irreversible or Irretrievable Commitment of Resources

The No Action Alternative would not require the commitment of resources. However, continued flooding risk and its potential to damage critical public facilities and infrastructure with resulting loss of resources would remain in the proposed project area.

The New Clear-Span Bridge Alternative would require the commitment of resources. The expenditure of labor for this alternative would occur predominantly during construction. Maintenance would occur throughout the life of the alternative, however, on-going maintenance would be the responsibility of the State of Nevada. Funding for this alternative would not be available for other uses and would therefore be irretrievable.

The Enlarged Concrete Arch Culverts Alternative would require the commitment of resources. The expenditure of labor for this alternative would occur predominantly during construction. Maintenance would occur throughout the life of the alternative, however, on-going maintenance would be the responsibility of the State of Nevada. Funding for this alternative would not be available for other uses and would therefore be irretrievable.

5.2 Short-Term Uses of the Environment and Maintenance and Enhancement of Long-Term Productivity

The New Clear-Span Bridge Alternative would require short-term uses of the environment, as documented in Sections 4.1 through 4.11. However, the uses of the environment would be offset by the long-term reduction in the risk of flooding and resulting damage to facilities. The 90 foot clear-span bridge, grade control structure and stream bank stabilization improvements would enhance the long-term productivity of resources by reducing flooding risks.

6 Public Participation and Agency Coordination

FEMA is the lead federal agency for the conducting NEPA compliance for the PDM project. It is the responsibility of the lead agency to expedite the preparation and review of the NEPA documents in a way that is responsive to the needs of the SPWD and the City of Caliente residents while meeting the spirit and intent of NEPA and complying with all NEPA provisions.

FEMA, with the assistance of R.O. Anderson Engineering, Inc. (R.O. Anderson), conducted an informal scoping program at the beginning of the NEPA EA process. R.O. Anderson met with or communicated with agency representatives that included the City of Caliente, Lincoln County Commissioners, Caliente Youth Center, Nevada State Department of Public Works, Natural Resource Conservation Service and Lincoln County Power District. FEMA also distributed the scoping notice (see appendices for notice and distribution list) to the Nevada State Historic Preservation Office United States Fish and Wildlife Service, Nevada Division of Wildlife, United States Army Corps of Engineers and Native American Indian tribes within the region (Goshute Tribal council, Duckwater Sho-Pai Tribes, Moapa Band of Paiutes, Las Vegas Tribe of Paiute Indians, Yomba Shoshone Tribe/Yomba Reservation Indian Colony, Kaibab Band of Paiute, Te-Moak of Western Shoshone Indians of Nevada, Ely Shoshone Tribe and the Paiute Indian Tribe of Utah). R.O. Anderson presented the proposed project and the scoping process at both a City of Caliente's City Council meeting and a Lincoln County Board of Commissioners' meeting during the scoping period and met with local stakeholders to solicit comments on the proposed project and alternatives (see appendices for Scoping Memo).

SPWD, with support from FEMA, published a Notice of Availability (NOA) of the Draft EA in the Lincoln County Record newspaper on December 13, 2013. The NOA of the Draft EA indicated a 15-day public comment period ending December 29, 2013. As detailed in the NOA, the Draft EA document was made available for public review and comment at two physical locations in Nevada (City of Caliente, City Hall Lobby, and State Public Works Division office in Carson City, Nevada) as well as on FEMA's website at http://www.fema.gov/media-library/assets/documents/85613.

During the public comment period, FEMA solicited written comments on the Draft EA, which were to be addressed to:

Donna M. Meyer, CEM, HPS
Deputy Regional Environmental Officer
FEMA Region IX
1111 Broadway, Suite 1200
Oakland, CA 94607

(510) 627-7728
donna.meyer@fema.dhs.gov

FEMA received one comment letter during the public review and comment period, which was provided by the Nevada State Historic Preservation Office. This letter is included in Appendix E. At the end of the public review and comment period, FEMA reviewed all comments and prepared this Final EA specifically to address those comments as part of the decision-making process. The availability of this Final EA will also be advertised in the Lincoln County Record.

7 References

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8 List of Preparers

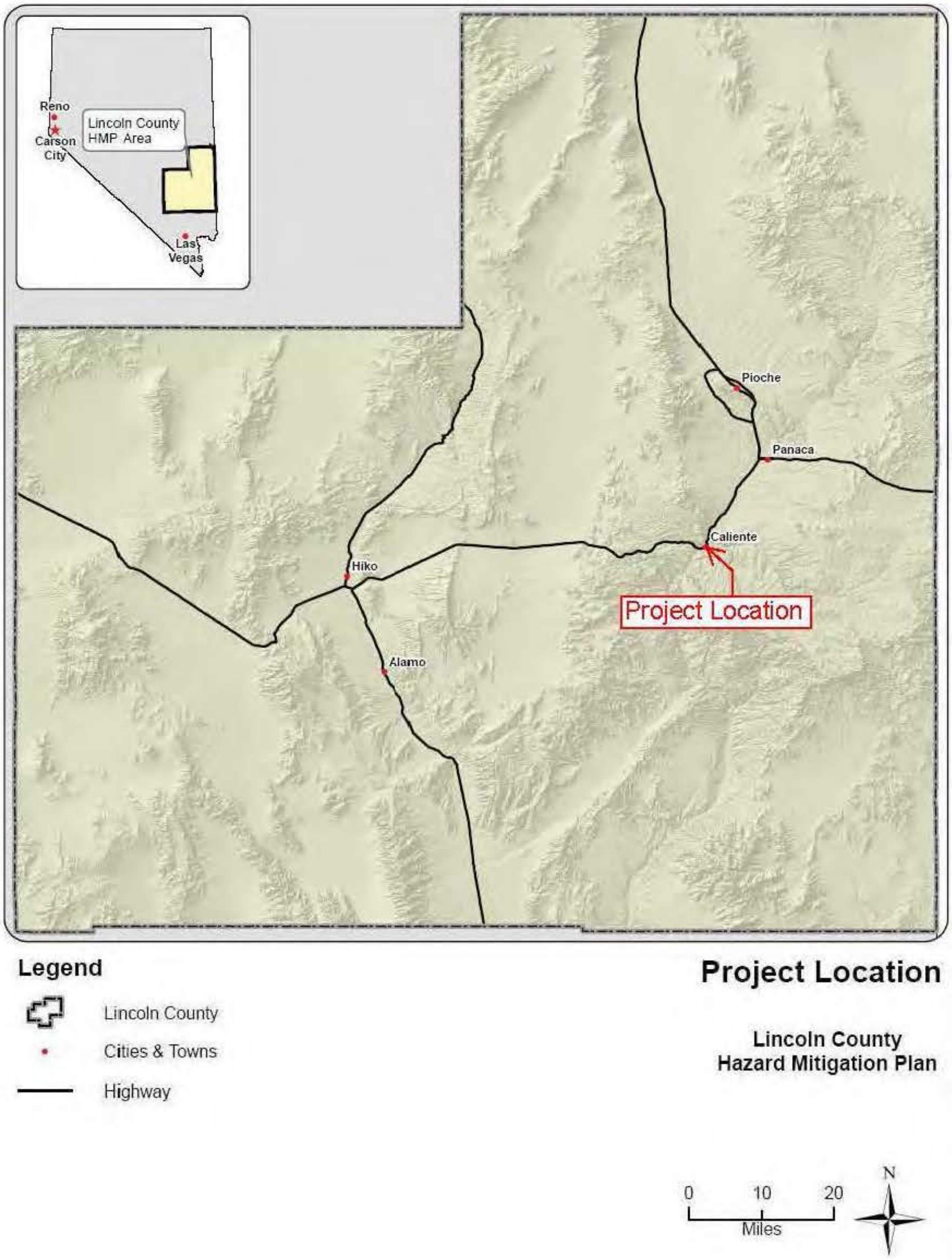
8.1 Federal Emergency Management Agency

- Donna M. Meyers, CEM, HPS, Deputy Regional Environmental Officer

8.2 R.O. Anderson Engineering, Inc. and Subconsultants

- Stephanie A. Hicks, AICP, Principal Planner/Grants Professional
- Coleen L. Shade, AICP CEP, LEED AP, Principal Planner
- David Thompson, PhD, PE, PH, D.WRE, CFM
- Mark A. Giambastiani, Ph.D., ASM Affiliates
- Leslie R. Fryman, M.A., ASM Affiliates
- Shannon Mahoney, ASM Affiliates
- Samantha Mackowiak, ASM Affiliates
- Garth Alling, Hauge Brueck Associates

Appendix A – Figures



Project Location

**Lincoln County
Hazard Mitigation Plan**

CITY OF CALIENTE
YOUTH CENTER DRIVE BRIDGE MITIGATION PROJECT
LINCOLN COUNTY, NEVADA

SEPTEMBER 2011

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1603 ESMERALDA AVENUE / POST OFFICE BOX 2229
MINDEN, NEVADA 89423
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WEB SITE: WWW.ROANDERSON.COM

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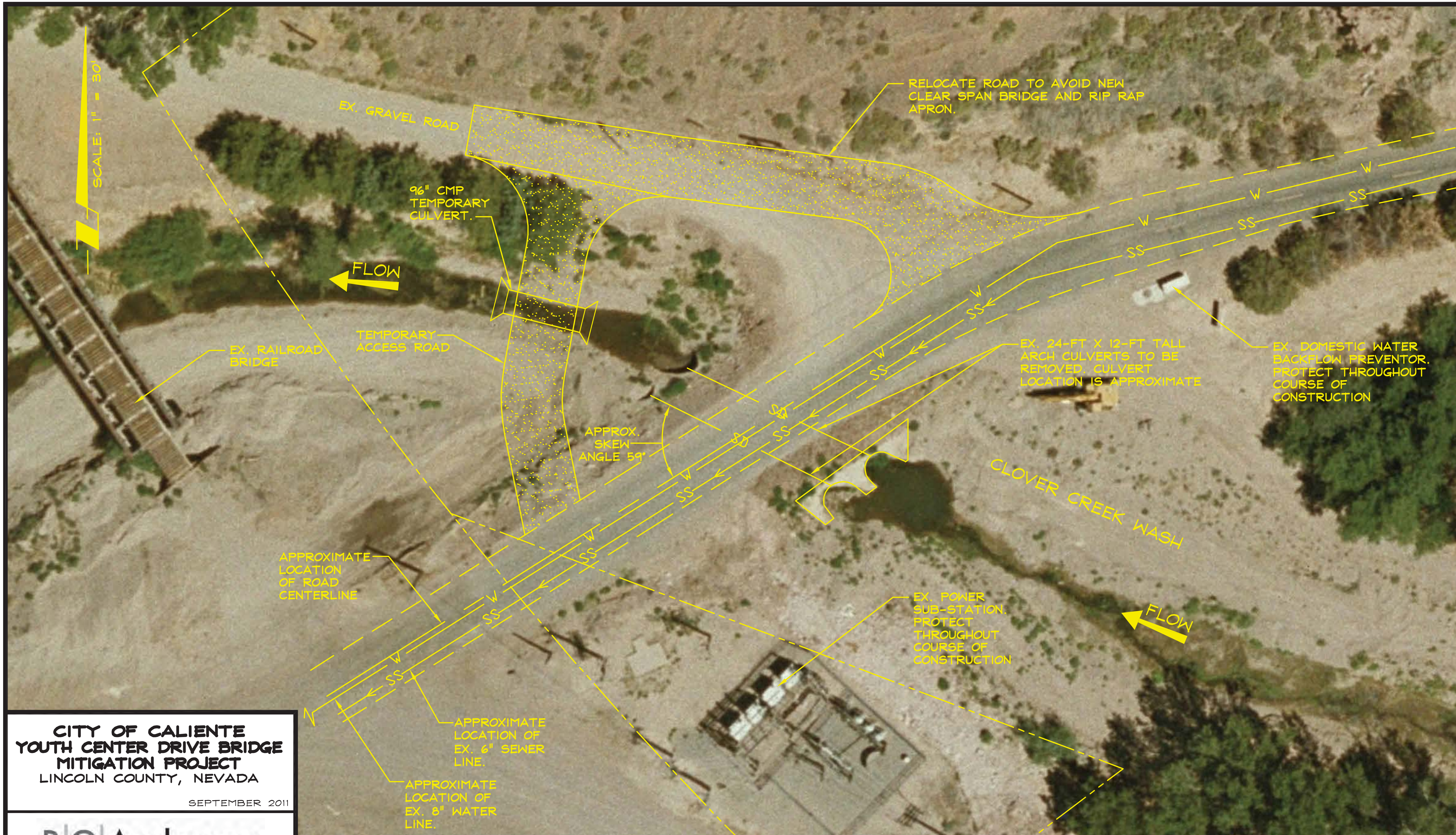

CITY OF CALIENTE
YOUTH CENTER DRIVE BRIDGE MITIGATION PROJECT
LINCOLN COUNTY, NEVADA

SEPTEMBER 2011

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WEB SITE: WWW.ROANDERSON.COM

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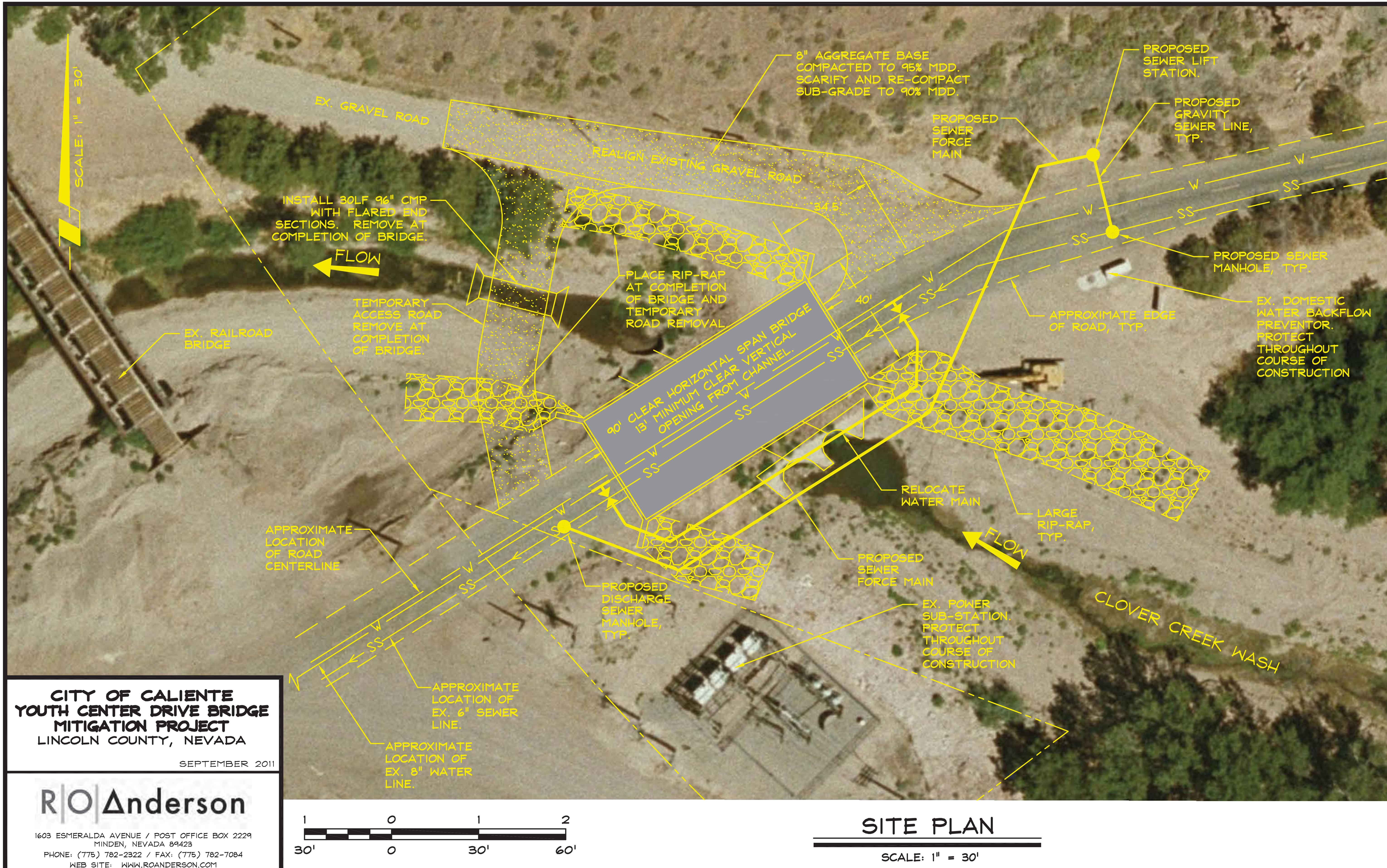
EXISTING SITE & DEMOLITION PLAN

SCALE: 1" = 30'



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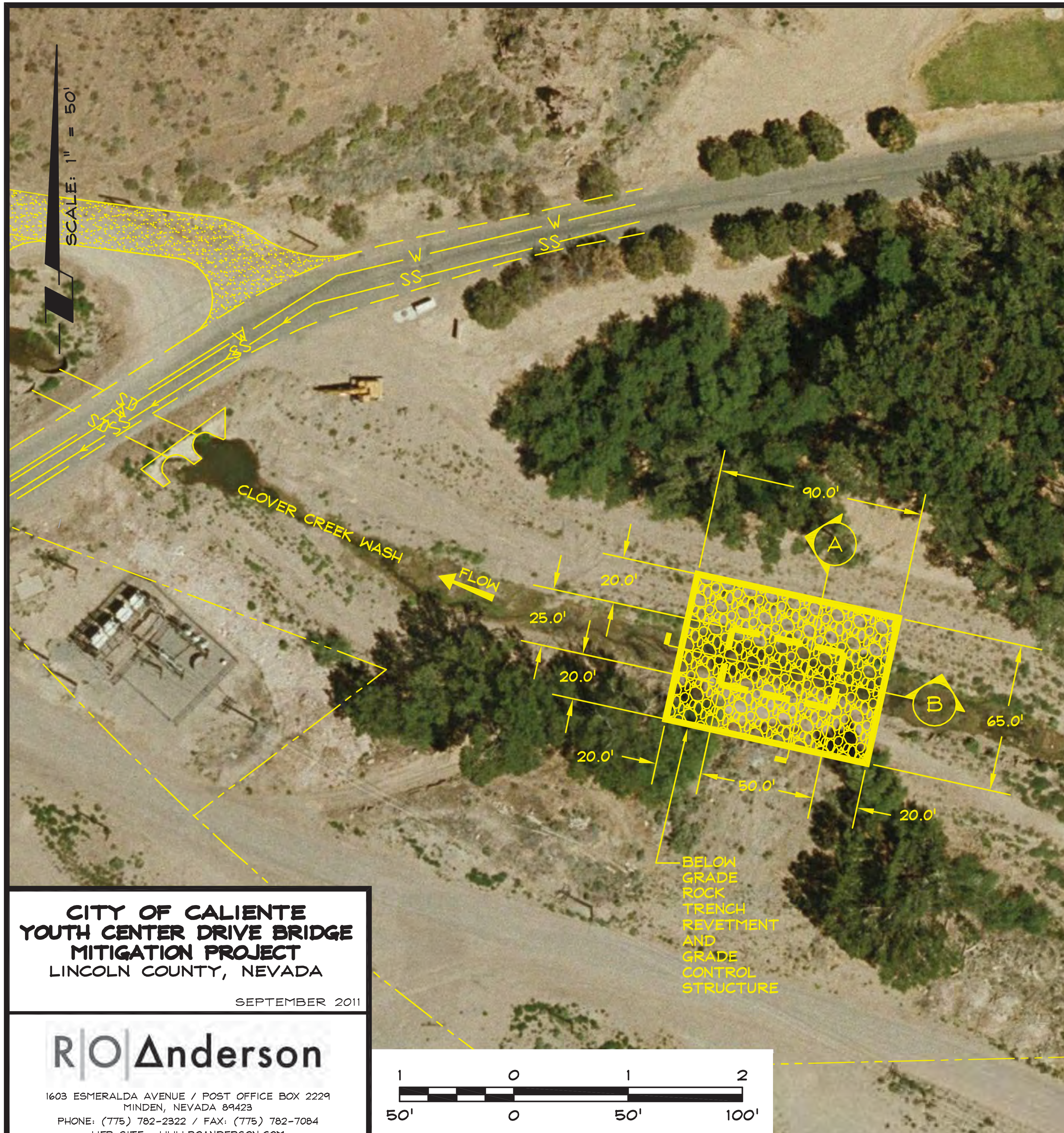
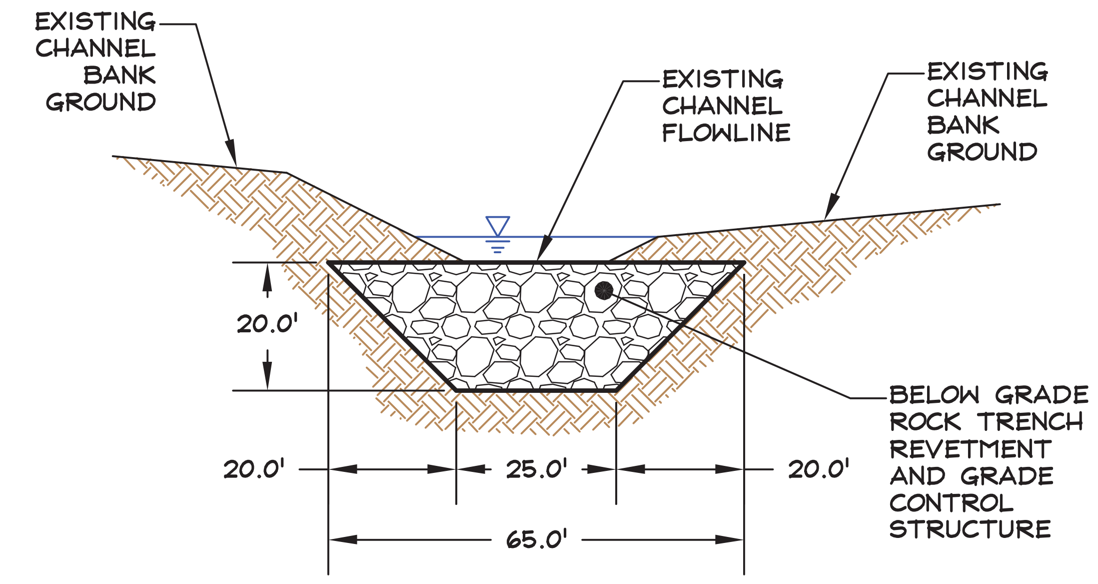
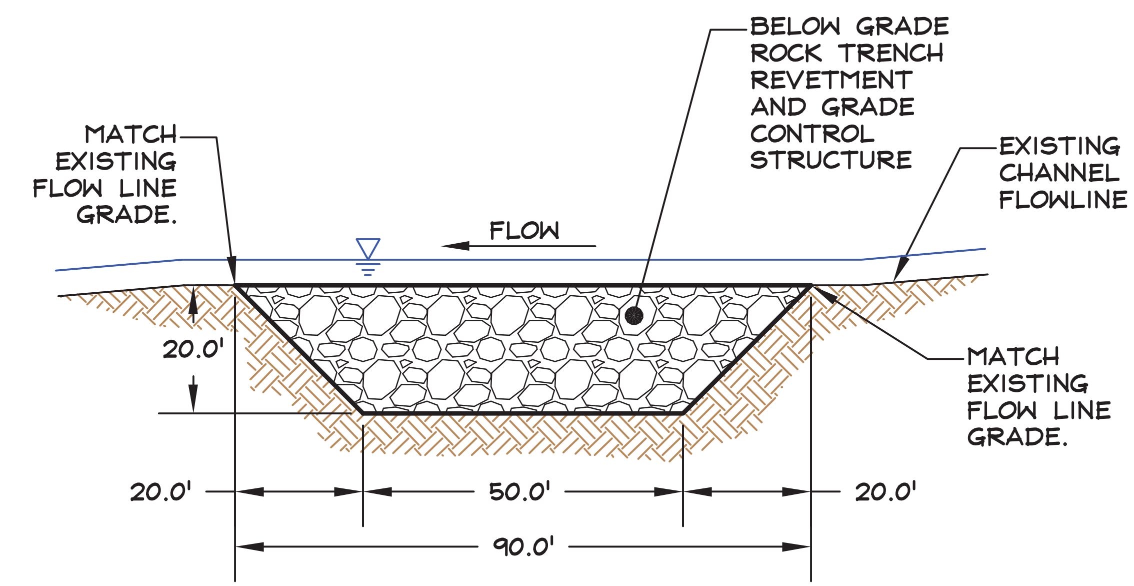




SECTION A

NO SCALE



SECTION B

NO SCALE

CITY OF CALIENTE
YOUTH CENTER DRIVE BRIDGE
MITIGATION PROJECT
LINCOLN COUNTY, NEVADA

SEPTEMBER 2011

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Appendix B – Scoping Letter, Distribution List, &

U.S. Department of Homeland Security
Region IX
1111 Broadway, Suite 1200
Oakland, CA 94607-4052

FEMA

June 4, 2013

Scoping of Issues
Proposed Caliente Youth Center Bridge Flood Mitigation Project
Caliente, Lincoln County, Nevada

Dear Interested Party:

The Department of Homeland Security's Federal Emergency Management Agency (FEMA) is considering providing financial assistance to the Nevada State Public Works Division (Subapplicant) through the Nevada Division of Emergency Management (Grantee) in support of replacing the Youth Center Drive Bridge. The assistance would be provided through the Pre-Disaster Mitigation Grant (PDM) Program. There have been two flood events in the past eight years that have jeopardized the safety of residents and staff of the CYC by eliminating access into or out of the Center. Repeated flooding of the access road because of the decrease in capacity of the existing culverts continues to be an issue.

An environmental assessment will be prepared in compliance with the National Environmental Policy Act (NEPA) to provide the decision-making framework that 1) analyzes a reasonable range of alternatives to meet the project purpose, 2) evaluates issues and impacts to local resources and values, and 3) identifies mitigation measures to lessen the degree or extent of any identified impact.

The construction of a new bridge structure and stream bank stabilization would improve the ability to achieve the following project goals:

- Eliminate flooding access issues for the CYC.
- Increase public health and safety for the residents and staff of CYC and the community as a whole.
- Improve stream hydraulics through improving stream dynamics.
- Reduce flood hazards to the community's critical infrastructure (water and sewer)
- Protect the community's electrical substation
- Reduce the financial cost of after-the-fact flood clean-up.

The EA to be prepared would evaluate a reasonable range of alternatives. The alternatives to be evaluated would include, at a minimum, the analysis of the following:

- Do nothing. FEMA would not provide financial assistance and the culverts would remain as they are or the Subapplicant would fund the proposed project through other means.

- Replace the culverts with a bridge structure that would not be impacted by 100-year flood flows.
- Replace existing culverts with larger diameter culverts to increase conveyance capacity.

FEMA, DEM and SPWD encourage public participation throughout the environmental review process. We invite the community, stakeholders and public agencies to provide written suggestions, comments and concerns about the project and what should be analyzed in the environmental assessment. **The scoping period will run for a total of 30 calendar days, beginning June 4, 2013 and ending July 5, 2013.**

SPWD will hold one public scoping session prior to the end of the 30-day scoping period at the Lincoln County Board of Commissioners' July 1, 2013 meeting. The purpose of this meeting is to provide an opportunity for the public to learn more about the proposed project, ask questions and provide comments. Meeting details for the July 1, 2013 meeting are as follows:

Monday, July 1, 2013
9:00 a.m.
Commissioners' Room
Lincoln County Courthouse
Pioche, NV

Your written comments, or if your agency has no comments, a written confirmation of receipt of this notice stating that your agency has no comments to contribute on the proposed project during the scoping period should be sent to the undersigned at the above address. If you have questions about the proposed project, or require additional information please contact me at donna.meyer@fema.dhs.gov or phone (510) 627-7728.

Sincerely,

Donna M. Meyer, CEM/HPS
Deputy Regional Environmental Officer
Non-Disaster Grant Programs

Enclosures: Vicinity Map
Site Plan

SCOPING DISTRIBUTION LIST

Leilani Takano, Acting Assistance Field Supervisor
FISH AND WILDLIFE SERVICE
NEVADA FISH AND WILDLIFE OFFICE
4701 North Torrey Pines Drive
Las Vegas, Nevada 89130

Patricia L. McQueary
Senior Regulatory Project Manager
US ARMY CORPS OF ENGINEERS
1325 J Street
Sacramento, CA 95814-2922

Victoria Barr, Field Manager
BUREAU OF LAND MANAGEMENT
P.O. Box 237
Caliente, Nevada 89008

Skip Canfield
NEVADA STATE CLEARINGHOUSE
NEVADA DIVISION OF STATE LANDS
901 S. Stewart Street, Suite 5003
Carson City, Nevada 89701-5246

Jeryl R. Gardner, P.E.
NEVADA DIVISON OF ENVIRONMENTAL PROTECTION
Bureau of Water Pollution Control
901 S. Stewart Street, Suite 401
Carson City, Nevada 89701-5249

Kim Davis, State NFIP Coordinator
NEVADA DIVISION OF WATER RESOURCES
901 S. Stewart St., Suite 2002
Carson City, Nevada 89701-5250

Elizabeth Ashby
Hazard Mitigation Officer
NV DIVISION OF EMERGENCY MANAGEMENT
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Carson City, NV 89701

Tony Wasley, Director
NV DEPARTMENT OF WILDLIFE
1100 Valley Road
Reno, Nevada 89512

Rebecca Lynn Palmer, Acting SHPO
NV STATE HISTORIC PRESERVATION OFFICER
901 S. Stewart Street, Suite 5004
Carson City, Nevada 89701-5248

Gus Nunez, Administrator
DEPARTMENT OF ADMINISTRATION
PUBLIC WORKS DIVISION
515 East Musser Street, Room 102
Carson City, Nevada 89701-4263

James Lawrence, Administrator
NEVADA DIVISION OF STATE LANDS
901 S. Stewart Street, Ste. 5003
Carson City, NV 89701-5246

Ashley Moore, Mayor
CITY OF CALIENTE
P.O. BOX 1006
Caliente, Nevada 89008

Stana Hurlburt
CITY OF CALIENTE
P.O. BOX 1006
Caliente, Nevada 89008

Gaylon Baker, Foreman
CITY OF CALIENTE
P.O. Box 1006
Caliente, Nevada 89008

Kevin Phillips
LINCOLN COUNTY
P.O. BOX 90
Pioche, Nevada 89043

Ed Higbee, Chairman
LINCOLN COUNTY
P.O. Box 242
Alamo, Nevada 89001

Rick Stever
LINCOLN COUNTY EMERGENCY MANAGEMENT
P.O. BOX 90
Pioche, Nevada 89043

Jamie Killian, Superintendent
CALIENTE YOUTH CENTER
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Caliente, Nevada 89008

Susan Hansen, Administrative Services Officer I
CALIENTE YOUTH CENTER
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Caliente, Nevada 89008

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John Christian, President
LINCOLN COUNTY POWER DISTRICT #1
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Pioche, Nevada 89043

Dave Luttrell, General Manager
LINCOLN COUNTY POWER DISTRICT #1
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Paul Donohue
LINCOLN COUNTY TELEPHONE
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James Gatzke, District Conservationist
NATURAL RESOURCE CONSERVATION SERVICES
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Caliente, Nevada 89008

Rudy Malfabon, P.E., Director
NEVADA DEPARTMENT OF TRANSPORTATION
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Victoria, Texas 77902

CALIENTE HOT SPRINGS RESORT
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Las Vegas, Nevada 89131

UNION PACIFIC RAILROAD
1001 Iron Horse Ct.
Las Vegas, NV 89106

THOMAS PETROLEUM, LLC
c/o Travis Joyner
P.O. Box 308
Caliente, NV 89008

DEPARTMENT OF THE ARMY

U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO CA 95814-2922

REPLY TO
ATTENTION OF

June 25, 2013

RECEIVED
JUL 01 2013
BY:

Regulatory Division SPK-2013-00576-SG

Ms. Donna Meyer
U.S. Department of Homeland Security - FEMA
Region IX
1111 Broadway, Suite 1200
Oakland, California 94607-4052

Dear Ms. Meyer:

We are responding to your June 4, 2013 request for comments on the Caliente Youth Center Bridge Flood Mitigation Project. The project is located on or near Clover Creek, Section 8, Township 4 S, Range 67 E, Mount Diablo Meridian, Latitude 37.6198895°, Longitude -114.509432°, Caliente, Lincoln County, Nevada. Your identification number is SPK-2013-00576-SG.

The Corps of Engineers is in support of either replacing the culverts with a bridge structure that would not be impacted by a 100-year flood event or replacing the existing culverts with larger diameter culverts to increase flood conveyance capacity.

The Corps has been involved with Section 404 permitting activities in response to a number of flood events in Caliente and will continue to be supportive of any decision that would alleviate the flooding issues along Clover Creek and Meadow Valley Wash.

We have no additional comments at this time.

The Corps of Engineers' jurisdiction within the study area is under the authority of Section 404 of the Clean Water Act for the discharge of dredged or fill material into waters of the United States. Waters of the United States include, but are not limited to, rivers, perennial or intermittent streams, lakes, ponds, wetlands, vernal pools, marshes, wet meadows, and seeps. Project features that result in the discharge of dredged or fill material into waters of the United States will require Department of the Army authorization prior to starting work.

Please refer to identification number SPK-2013-00576-SG in any correspondence concerning this project. If you have any questions, please contact me at 196 E Tabernacle Street Room 30, St. George, Utah 84770, email *Patricia.L.McQueary@usace.army.mil*, or telephone 435-986-3979. For more information regarding our program, please visit our website at *www.spk.usace.army.mil/Missions/Regulatory.aspx.*

Sincerely,

Patricia L. McQueary
Senior Regulatory Project Manager
St. George Regulatory Office
Sacramento District

STATE OF NEVADA
DEPARTMENT OF WILDLIFE
1100 Valley Road
Reno, Nevada 89512
(775) 688-1500 • Fax (775) 688-1595

BRIAN SANDOVAL
Governor

TONY WASLEY
Director

RICHARD L. HASKINS, II
Deputy Director

PATRICK O. CATES
Deputy Director

RECEIVED
JUN 28 2013
BY:

June 24, 2013

NDOW-SR: 13-229
LVO-13-044

Donna M. Meyer
FEMA Region IX
Deputy Regional Environmental Officer
Non-Disaster Grant Programs
1111 Broadway, Suite 1200
Oakland, CA 94607-4052

Re: Scoping of Issues for the Proposed Caliente Youth Center Bridge Flood Mitigation Project
Caliente, Lincoln County, Nevada

Dear Ms. Meyer:

The Nevada Department of Wildlife (Department) thanks you for the opportunity to provide comment. The Department supports the proposed Caliente Youth Center (CYC) bridge replacement and stream bank stabilization project for increasing public health and safety. The following comments are intended as productive inputs towards the development of the Environmental Assessment.

All birds protected under the Migratory Bird Treaty Act (MBTA) are also State Protected (NAC 503.050). Recommended impact minimization measures for migratory birds include:

- Ground disturbing activities should avoid the bird breeding and nesting season which roughly occurs between March 1 and July 31;
- If this seasonal avoidance is not practicable, then the Department recommends a qualified biologist survey the project site prior to any ground disturbing activities to determine if nesting by migrants is underway; and,
- In the event an active nest (containing eggs or young) is discovered or frequently attended by adult birds, a buffer area around the nest appropriate for the involved species must be identified and avoided until young birds fledge.

These measures would be consistent with preventive actions advocated by the U.S. Fish & Wildlife Service concerning migratory species protected under the MBTA.

There is potential for the yellow-billed cuckoo (federal Endangered Species Act candidate species, and Department species of conservation priority) to frequent the cottonwood patches and linear stretches of cottonwood habitat nearby. The best patch of habitat is immediately adjacent to the bridge area and CYC facilities. The Department conducted yellow-billed cuckoo surveys several years ago starting at the CYC's bridge and heading east to the point of restricted access by the Union Pacific Rail Road (approximately 2.5 miles). Although no cuckoo detections were recorded then, absence of the species is not inferred. Survey efforts are planned for the present breeding season. While we do not foresee presence of the yellow-billed cuckoo having bearing on the project's implementation, checking back with the Department later this year for survey results and any recommendations based on those results would be encouraged.

Thank you again for this opportunity to provide input. For additional assistance, please contact Habitat Biologist Tracy Kipke at 702.486.5127 x3612 or by e-mail at tkipke@ndow.org.

Sincerely,

D. Bradford Hardenbrook
Supervisory Habitat Biologist
Southern Region, Nevada Department of Wildlife
4747 Vegas Drive, Las Vegas, Nevada 89108
702.486.5127 x3600; 702.486.9857 FAX
bhrdnbrk@ndow.org

TK:tk

cc: NDOW, Files

Stephanie Hicks

From: Meyer, Donna <Donna.Meyer@fema.dhs.gov>
Sent: Monday, June 10, 2013 8:19 AM
To: 'Elizabeth Ashby (eashby@dps.state.nv.us)'; Stephanie Hicks
Cc: Flack, Joan
Subject: FW: Proposed Caliente Youth Center Bridge Flood Mitigation Project
Attachments: bridgealternative.pdf

FYI Scoping response it appears.

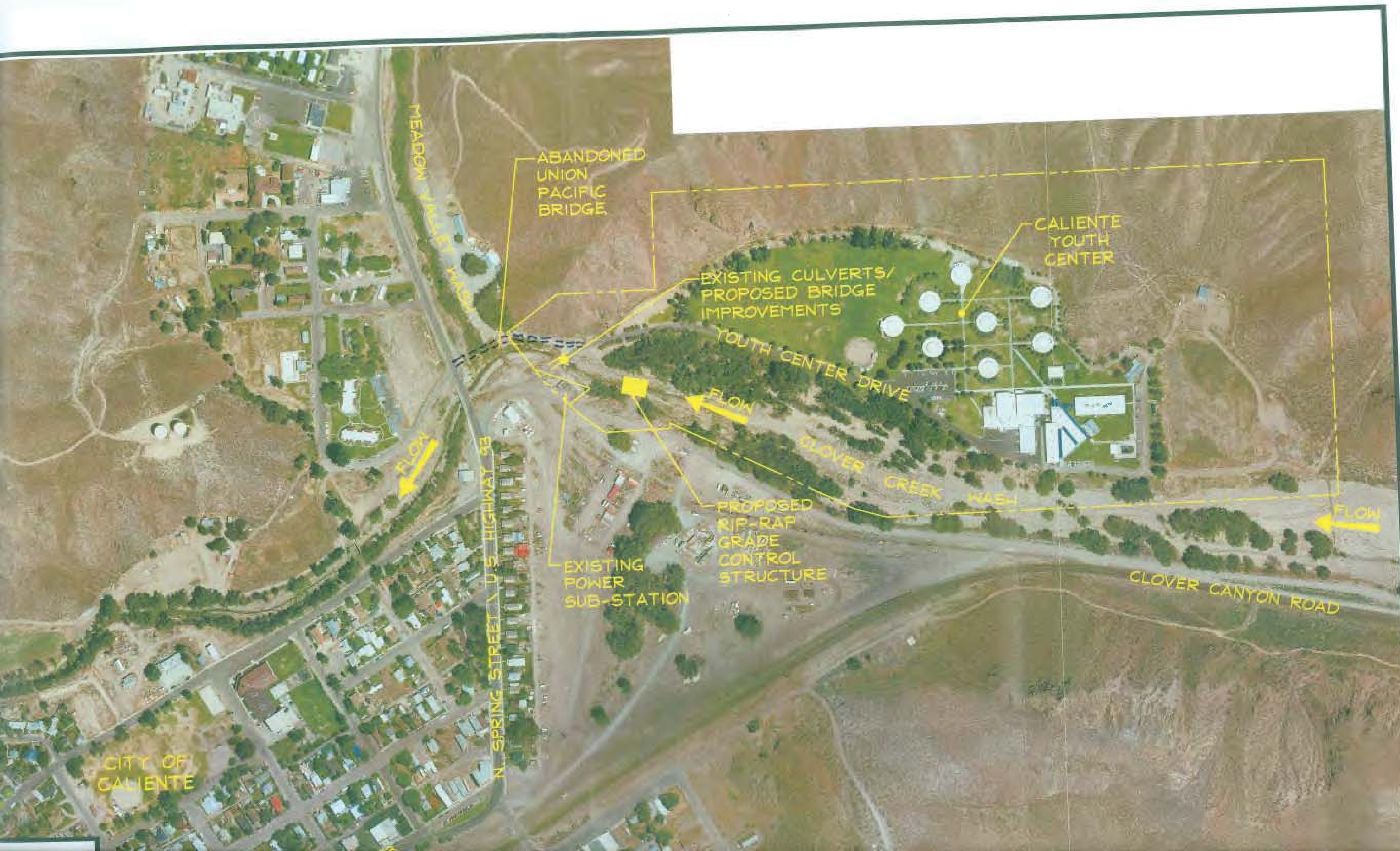
Donna M. Meyer, CEM,HPS
Deputy Regional Environmental Officer
FEMA Region IX
1111 Broadway, Suite 1200
Oakland, CA 94607
(510) 627-7728
donna.meyer@fema.dhs.gov

From: Gatzke, James - NRCS, Caliente, NV [mailto:James.Gatzke@nv.usda.gov]
Sent: Friday, June 07, 2013 5:14 PM
To: Meyer, Donna
Subject: Proposed Caliente Youth Center Bridge Flood Mitigation Project

Donna:

The comments below are regarding the proposed Caliente Youth Center (CYC) Bridge flood mitigation project. The existing culvert structure cannot handle flood flows and must be removed before the next flood event. In order for the project to have a positive impact on the environment, it is ideal to minimize the infrastructure restricting floodplain development and to allow the stream access to the floodplain. The US 93 bridge, the UPRR bridge, the CYC bridge and road, and the city substation restrict floodplain development. Clover Creek below CYC and downstream Meadow Valley Wash are developing a wider floodplain to better handle flood flows. The larger culvert alternative will still restrict floodplain development more than the bridge alternative. If the UPRR bridge could also be removed, the project would have greater positive impact on floodplain development. A culvert limits stream access to the floodplain. A bridge would not limit stream access to the floodplain.
The best alternative for positive environmental impact and decreased flood risk is to move the location of CYC bridge, so that it crosses Meadow Valley Wash above the confluence instead of Clover Creek. Flood flows in Meadow Valley Wash are less frequent and less severe in comparison to Clover Creek. This alternative will require an easement, right-of-way or use of eminent domain to cross the property N of the confluence. However, the alternative will provide safer access to the property for the owner. The alternative is also the best option for allowing stream access to floodplain and floodplain development.

JAMES M. GATZKE
District Conservationist
USDA Natural Resources Conservation Service
PO Box 8; 360 Lincoln Street
Caliente, NV 89008
Office: 775-726-3101
Fax: 775-726-3754



ABANDONED UNION PACIFIC BRIDGE
MEADOW VALLEY WASH
CALIENTE YOUTH CENTER
EXISTING CULVERTS/ PROPOSED BRIDGE IMPROVEMENTS
YOUTH CENTER DRIVE
FLOW
FLOW
FLOW
CLOVER CREEK WASH
PROPOSED RIP-RAP GRADE CONTROL STRUCTURE
EXISTING POWER SUB-STATION
CLOVER CANYON ROAD
N. SPRING STREET \ U.S. HIGHWAY 93
CITY OF CALIENTE

Appendix C – Scoping Memorandum

M E M O R A N D U M

DATE: August 9, 2013

TO: Caliente Youth Center Bridge Project
Steering Team

FROM: Coleen Shade, AICP- CEP, LEED AP
R.O. ANDERSON ENGINEERING, INC.

SUBJECT: Environmental Assessment Scoping Memo

The purpose of a scoping period for an environmental document is to invite agencies, stakeholders, and the public to participate in the "Scoping Process" by reviewing the initial proposal as outlined in the scoping notice and providing comments to support the development of an Environmental Assessment (EA). An environmental assessment will be prepared in compliance with the National Environmental Policy Act (NEPA) to provide the decision-making framework that 1) analyzes a reasonable range of alternatives to meet the project purpose, 2) evaluates issues and impacts to local resources and values, and 3) identifies mitigation measures to lessen the degree or extent of any identified impact.

FEMA intends to develop an EA for the action of removing the two existing twelve-foot pipe culverts and concrete headwall which constructed in the bed of the Clover Creek at Youth Center Drive in approximately 1962. In their place it is proposed to construct a new single span bridge 90 feet long with a width of 40 feet. The scoping process solicits assistance in identifying issues and concerns, developing alternatives, and identifying potential impacts as a consequence of implementing the proposed project.

The purpose for this memorandum is to document the scoping process and responses received from agencies, stakeholders and the general public during the scoping period for the Caliente Youth Center Bridge Project Environmental Assessment. The 30-day scoping period began June 4, 2013 and closed July 5, 2013.

Scoping efforts included posting the scoping notice in the local Lincoln County newspaper, distributing the scoping notice to a specific list of agencies and stakeholders (see attached Scoping Notice List in Appendix B), submitting the scoping notice to the Nevada State Clearing House, announcing the scoping period at a City of Caliente City Council Meeting (July 1, 2013), presenting to the Lincoln County Board of Commissioners (July 1, 2013) and conducting interviews with 10 individual local stakeholders.

Confirmed Project Goals based on public meetings and individual interviews.

- ❖ Eliminate access issues due to flooding
- ❖ Increase public safety
- ❖ Improve stream hydraulics through improving stream dynamics
- ❖ Reduce or eliminate flood hazards to critical infrastructure including water and sewer service lines
- ❖ Protect the community's electrical substation
- ❖ Reduce the cost of after-the-fact flood clean up

The following bulleted list of comments provides a summary of the responses received.

1. A clear span bridge is the only structure that will support all of the stated project goals.
2. A two culvert "fix" will not solve the problem.
3. The inclusion of the proposed grade control is critical to the success of the project.
4. Clover Creek stream banks should be rip-rapped from above the CYC bridge to below the highway bridge.
5. The concrete abutment just above the highway bridge needs to be removed.
6. Look at old RXR crossing bridge as an emergency access/back up. Should be evaluated for structural safety.
7. Access safety issues during times of flooding must also include the safety of individuals working to protect the integrity of utilities and other infrastructure.
8. Solution should address minimizing personal property loss.
9. The City of Caliente must be an active partner in the solutions identified to implement.
10. The City of Caliente is the owner of the electrical substation whose integrity has been compromised due to flooding.
11. The substation is nearing the end of its useful life and there may be an option for the City to abandon the substation and connect to the new substation built by Lincoln County Power District. In order to do this the City would have to reconfigure all of the existing circuits in town to be consistent with the voltage of the new substation.
12. Need to design project such that the banks are slicker, keep bank roughness at a higher elevation on the bank.
13. Need to consider utilities in the bridge design, for example, will water line be attached to underside of bridge and how will sewer be addressed.

Recommend sewer is designed to run under creek bed using an inverted syphon.

14. Need to regain equilibrium through creek to maintain itself and keep moving bed load.
15. Historically there had been cattle grazing above the project area. This kept stream vegetation (roughness) down to a minimum.
16. Property owner above project area periodically dredges materials out of his stream reach and piles them along the stream bank to prevent flooding of his fields. This is a practice that could be detrimental to the downstream project when there is a storm event that washes these stock piled materials downstream and into the proposed project.
17. The City of Caliente currently has a 404 permit with the USACOE to maintain the channel function. (Note: it is a temporary permit that needs to be re-issued every season.)
18. USACOE is in support of solutions that reduce or eliminate the flooding access issue at the Caliente Youth Center crossing.
    - Ground disturbing activities associated with the implementation of the proposed project will be required to avoid the breeding and nesting season (roughly March through July). If this is not practicable, a qualified biologist must be engaged to conduct a survey to determine if any nesting is underway.
19. If nesting migrant birds are observed a buffer around the nest appropriate for the species is to be established where no construction activity can occur until young birds have fledged.
20. Culverts limit access of flood waters to the flood plain and should not be considered.
21. The best alternative for positive environmental impact and decreased flood risk is to move the location of CYC bridge, so that it crosses Meadow Valley Wash above the confluence instead of Clover Creek. Flood flows in Meadow Valley Wash are less frequent and less severe in comparison to Clover Creek. This alternative will require an easement, right-of-way or use of eminent domain to cross the property north of the confluence. However, the alternative will provide safer access to the property for the owner. The alternative is also the best option for allowing stream access to floodplain and floodplain development.

Appendix D – Preliminary Hydrology & Hydraulic Analysis

R|O|Anderson

Report

Hydrology and Hydraulic Analysis

of

Caliente Youth Center Access Road

for

Nevada State Public Works Division

September 23, 2011

MAILING ADDRESS
P.O. Box 2229
Minden, NV 89423

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595 Tahoe Keys Boulevard
Unit A2 & A3
South Lake Tahoe, CA 96150
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Hydrology and Hydraulic Analysis

Caliente Youth Center Access Road

for

Nevada State Public Works Division

by

David B. Thompson, Ph.D., PE, D.WRE, CFM
R.O. Anderson Engineering, Inc.
Minden, Nevada

September 23, 2011

PROFESSIONAL ENGINEER · STATE OF NEVADA
DAVID B. THOMPSON
Exp 6/30/12
CIVIL
No. 19784

September 23, 2011

Hydrology

The hydrology for Clover Creek and Meadow Valley Wash was taken from the effective Flood Insurance Study (FIS; Memorandum dated 12/03/2005 by Andrea L. Ryon, Michael Baker, Jr.). The drainage area of Meadow Valley Wash at the confluence of Meadow Valley Wash and Clover Creek is 1,227 mi^2 and the drainage area of Clover Creek is 258 mi^2. In that memorandum, the discharges associated with various flood recurrence intervals were presented and are listed in Table 1.

Table 1. Flood flows from the FEMA Flood Insurance Study for Meadow Valley Wash and Clover Creek (HDR, 2008). Discharges presented in cubic feet per second (cfs).

	Watershed Flood Flow (cfs)	
Hydrologic Event	Meadow Valley Wash	Clover Creek
10-year	2,020	1,093
50-year	6,691	3,705
100-year	10,140	4,696
500-year	23,189	9,555

Two relatively recent flood events occurred on Clover Creek. One was in 2005 and the second in 2010. The 2005 event was the most severe. Although no flowrates are available for Clover Creek, the estimate for this flood was 8,000 cfs on Meadow Valley Wash. The 2010 event was less severe with a reported discharge on Meadow Valley Wash of 1,680 cfs. During 2005 event, the Caliente Youth Center access road was overtopped, cutting off access to the center. In the 2005 event, substantial damage occurred to the access road, which resulted in evacuation of the youth center.

If another event of the magnitude that occurred in the 2005 or 2010 occurs, such an event is likely to severely damage the access road. This would result in loss of access during the several days required to effect repairs. In addition, there is substantial risk that the water line and sanitary sewer lines embedded in the roadway embankment (and above the existing culverts) could be compromised, temporarily interrupting services to the CYC site. Loss of access attributable to the period of overtopping is estimated to be about one day. However, if substantial damage occurs to the roadway, the water line, or the sewer line, the loss of service and access could be greater, perhaps as much as 5–7 days, depending on the extent of damage.

During the 2010 flood event, the electric substation that provides power to the City of Caliente was threatened by floodwaters. The problem, as described by Caliente personnel, was that a strong recirculation (eddy current) on the left side of Clover Creek caused substantial bank erosion. The erosion was sufficient that emergency placement of bank protection was required to mitigate the threat to the substation. The ability of the emergency measures to provide long-term protection to the substation is unclear. Therefore, until a complete engineering analysis of the emergency bank protection is conducted, the substation remains at risk of either bank erosion subsequent impact to substation facilities from an event similar to the 2010 event or flooding in the event of a larger hydrologic event.

An approximate flood frequency curve was developed using the U.S. Geological Survey (USGS) annual peak runoff series from Streamgaging Station 09418500 Meadow Valley Wash at Caliente. The period of record for the gage is 56 years. The flood-frequency curve is displayed on Figure 1. What is important to observe is that the 2005 event was between a 50- and 100-year event and the 2010 event was between a 5- and 10-year event. Although these flood events occurred on Meadow Valley Wash (where the USGS gage is located), it is reasonable to assume that flows from Clover Creek were of approximately the same recurrence interval. That is, the peak discharge from Clover Creek for the 2005 event was probably between a 50- and 100-year event and that from the 2010 flood was probably between a 5- and 10-year flood event.

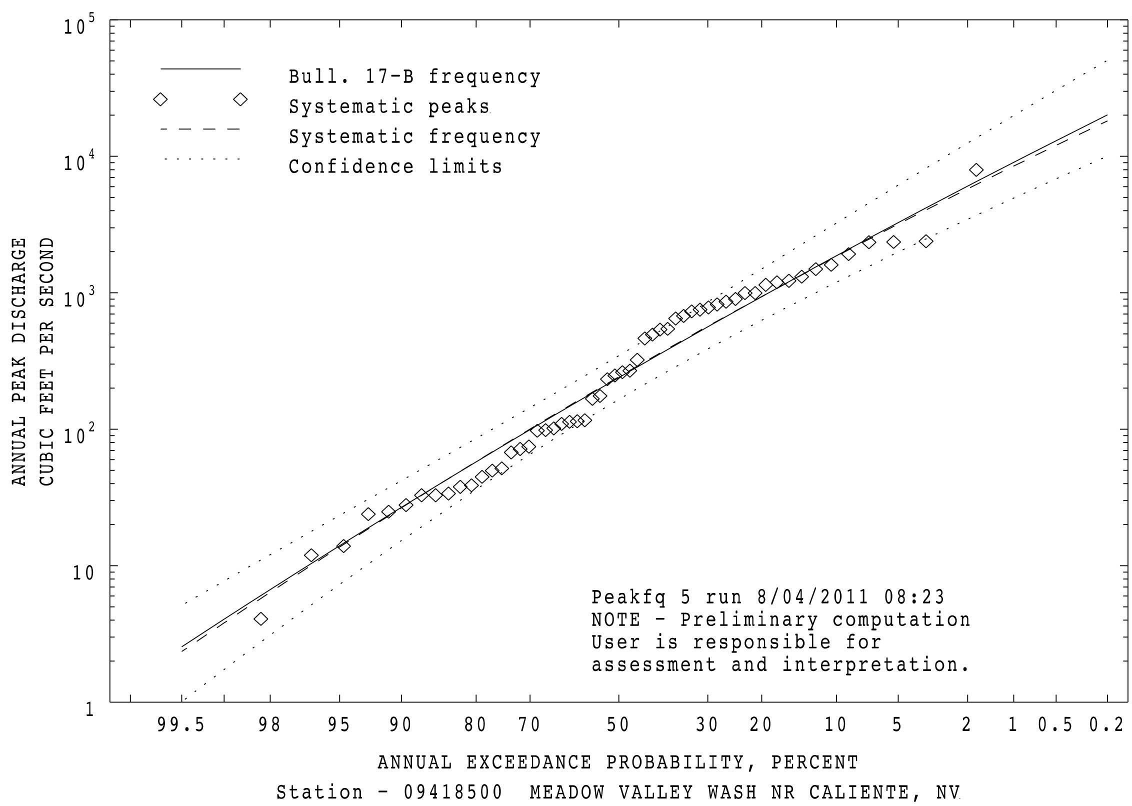


Figure 1. Preliminary flood frequency curve for USGS Streamgaging Station 09418500 Meadow Valley Wash near Caliente, Nevada.

Standard FEMA protocol for development of the regulatory floodplain is to assume both streams at a confluence are at the peak of their respective base flood hydrographs. Although this is a reasonable and conservative assumption for floodplain-mapping purposes, the actual probability of concurrent flooding at a stream confluence depends on a number of factors (Kilgore and others, 2010). When two watersheds differ in drainage area and effective watershed slope, then the likelihood of both peaks arriving at exactly the same time is substantially reduced.

Phillips (2008) presented design hydrographs of discharge from the 10-year design event for both Meadow Valley Wash and Clover Creek, the watersheds involved in this study. These hydrographs are displayed on Figure 2. Although the hydrographs displayed on Figure 2 do not represent runoff hydrographs from observed events, they provide valuable insight into the relative time response of the two watersheds that affect the project site. The green curve is the 10-year design runoff hydrograph from the Clover Creek watershed. The blue curve is the 10-year design runoff hydrograph from the Meadow Valley Wash watershed. The red curve, although not important to this discussion, is the combined 10-year design hydrograph at the confluence of Clover Creek and Meadow Valley Wash, which is downstream from the site of the current study.

What is important to observe from Figure 2 is that the time to peak discharge from the two watersheds differs by many hours, with a relatively small amount of flow in Meadow Valley Wash at the time the peak from Clover Creek arrives at the study area. Therefore, for the purposes of analyzing the CYC access road crossing of Clover Creek and development of alternatives, a relatively low flowrate (100 cfs) was used in Meadow Valley Wash and the base flood discharge (100-year event) was used in Clover Creek. Once a design was confirmed, then the results were checked using the FEMA effective model in which it is assumed that flood peaks arrive contemporaneously.

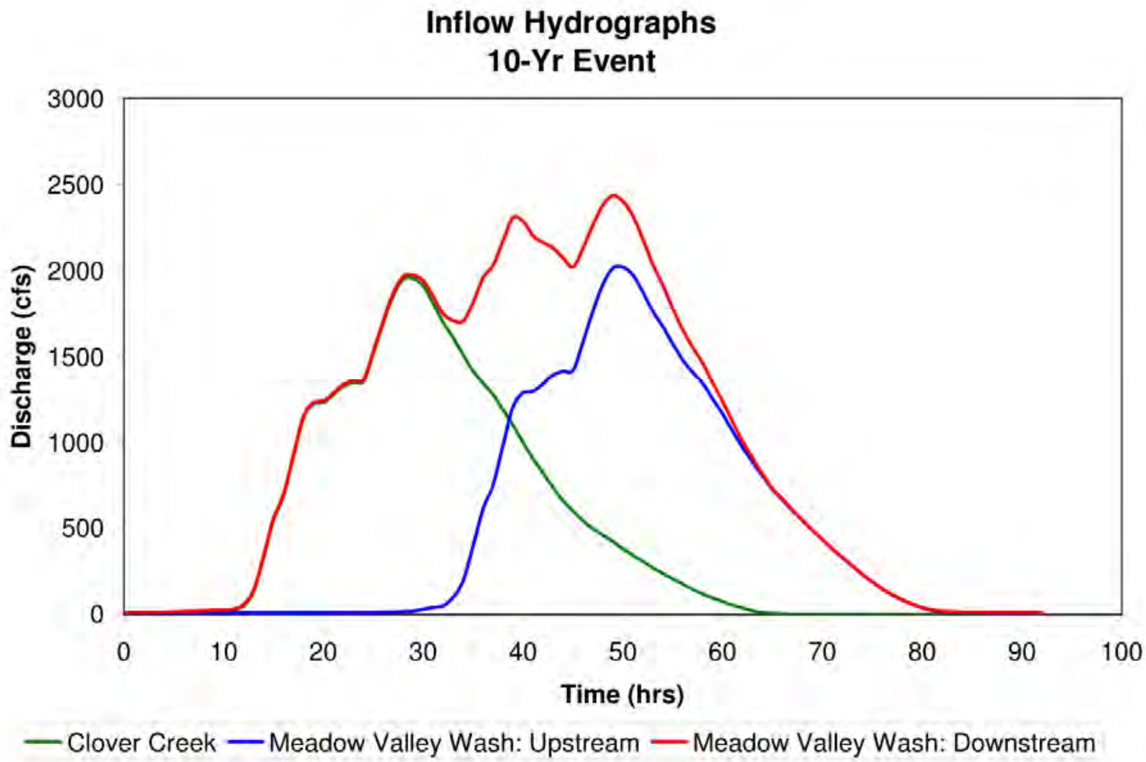


Figure 2. Hydrographs from the 10-year design event from Meadow Valley Wash and Clover Creek (from Philips, 2008).

Alternatives

Five alternatives were considered. They are:

1. Do nothing,
2. Eliminate the crossing and access road,
3. Replace the existing access road and culverts with a low-water crossing,
4. Replace the existing access road and culverts with larger culverts, and
5. Replace the existing access road and culverts with a full-span structure.

Alternative 1 has no associated direct cost and no benefit. It is not a feasible alternative. Alternative 2 is also not appropriate because there is no other practically feasible route to provide access to the CYC facility. Alternative 3 was also eliminated because access is required to the Center during flood events. There are a number of full-time residents on the site and emergency services must have access to the site during flood events (as well as at other times). Therefore, Alternatives 4 and 5 were the only meaningful alternatives. A set of hydraulic models was created to determine the size of the culverts and the length of the spanning structure required so that engineer's cost estimates could be constructed. The technical and economic benefits of each alternative were then evaluated. However, the cost estimate for only the selected alternative is presented for the purposes of clarity of this report.

Hydraulics

The effective HEC-RAS models were obtained from HDR, who was the FEMA contractor for the most recent revision of the FIS. The flowrates listed above were used by HDR in the effective model of Clover Creek and Meadow Valley Wash. The HEC-RAS models include the confluence of Meadow Valley Wash and Clover Creek, which occurs a few hundred feet downstream from the CYC access road culverts.

Flows from Clover Creek are conveyed under the CYC access road by a double 12 ft diameter culvert system. These culverts were modeled in the effective model with blockage (sediment) to a depth of nine feet above the inverts of the culverts. When clear, the culverts were probably capable of conveying the 10-year event without overtopping the access road. This level of risk (design event) is appropriate for local drainage, but is insufficient for a primary crossing over the drainageway of a watershed of significant size, such as Clover Creek. In the state represented in the effective model (9 ft of 12 ft diameter blocked), the capacity of the existing culvert system is between 400 and 500 cfs, depending on flow conditions.

The existing culverts do not have sufficient capacity to convey flows from hydrologic events of appropriate design level for the single access road to the CYC site. This statement is also true even if the culverts were cleared and their conveyance adequately maintained. If they were clear, the capacity of the two culverts combined is probably about 1,000 cfs. This is approximately the magnitude of the 10-year event.

The FEMA effective hydraulic model (HEC-RAS) was modified to accommodate potential structures by making adjustments to the upstream and downstream cross sections and modifying the crossing specification in HEC-RAS. The modified model was operated and results extracted, then evaluated. The process is iterative with subsequent adjustments to the structure size. Components adjusted included:

1. Culvert size/bridge span length,
2. Road profile.

Results and Evaluation

Alternatives 1 and 2 were not evaluated using HEC-RAS hydraulic modeling. The do-nothing, abandon the crossing, and low-water crossings are feasible from a technical perspective, but will not satisfy the need for a crossing that is available during a relatively rare hydrologic event (such as the 100-year event).

For Alternative 4 (concrete arch culverts), a double 42 ft by 12 ft ConSpan prefabricated concrete arch culvert system will allow discharge from the 100-year event to pass through the culvert system without overtopping the crossing, provided Meadow Valley Wash is not at it's peak discharge simultaneously. That is, if the peak discharges from both watersheds arrive simultaneously (less likely than the Base Flood Event) then water will overtop the access road because of backwater at the confluence of the two streams, but not because of structure capacity.

For Alternative 5 (bridge span), a prefabricated structure with an effective clear span of 70 ft and a low-chord not less than 4408 ft will allow the 100-year event to pass through the bridge without overtopping the access road at the crossing, again provided the peak discharges from both watersheds do not arrive simultaneously. Differences between the two approaches are in the cost to construct and intangible attributes of each approach.

For both alternatives, the existing water line and sewer service will have to be moved. The water line is not an issue because it is under pressure and the relocation will have little impact, if any. However, either a pump station and force main or an inverted siphon will be required to replace the sewage collection line. Inverted siphons are not generally favored because of maintenance considerations. Therefore, a package pumping plant and force main is recommended.

Results of the design given only the Clover Creek drainage is in flood condition are presented in Table 2. Results from the alternatives given both Meadow Valley Wash and Clover Creek are producing peak 100-year flood discharges are presented in Table 3.

Table 2. Water-surface elevations and differences at the proposed Caliente Youth Center access road crossing of Clover Creek if only Clover Creek is at the peak discharge from the 100-year event.

Effective Model		No Change		ConSpan		Low-Water		Bridge	
WSE (ft)	Delta (ft)	WSE (ft)	Delta (ft)	WSE (ft)	Delta (ft)	WSE (ft)	Delta (ft)	WSE (ft)	Delta (ft)
4409.5	-0.2	4409.5	-0.2	4407.4	-2.1	4406.7	-3.1	4407.2	-2.5

In Table 2, *WSE* is water-surface elevation and *Delta* is the difference between the water-surface elevation computed using HEC-RAS and the Base Flood Elevation (BFE) from the FEMA effective model. A negative value indicates that the computed water-surface elevation is less than that in the effective model. Given that Clover Creek will probably produce its peak discharge before Meadow Valley Wash, the likely impact of replacing the existing access road crossing is a substantial reduction in stage during the design flood event. This will probably result in reduced flooding upstream from the structure and less impact on the Caliente Youth Center site and its access road.

In Table 3, the same variables are presented as in Table 1, with the exception that the standard FEMA assumption that both watersheds are at the peak discharge simultaneously was used. Therefore, WSE in Table 3 is the estimated with-project BFE. Use of either the ConSpan culverts or the prefabricated bridge spanning Clover Creek results in a decrease in water-surface elevation of a few tenths of a foot.

Table 3. Water-surface elevations and differences at the proposed Caliente Youth Center access road crossing of Clover Creek if both Meadow Valley Wash and Clover Creek are at the peak discharge from the 100-year event (FEMA assumption).

Effective Model		No Change		ConSpan		Low-Water		Bridge	
WSE (ft)	Delta (ft)	WSE (ft)	Delta (ft)	WSE (ft)	Delta (ft)	WSE (ft)	Delta (ft)	WSE (ft)	Delta (ft)
4409.7	0.0	4409.7	0.0	4409.5	-0.2	4409.1	-0.7	4409.6	-0.1

Detailed views of the water-surface profile at the CYC access road crossing are presented on Figures 3 and 4. The solid blue shading represents the water-surface profile from the one-percent annual exceedance frequency event (the 100-year event), the blue line represents the water-surface profile from the 0.2 percent annual exceedance probability event (the 500-year event), the black line represents the channel low point profile, and the remaining two lines represent the profiles of the left and right bank lines.

The effective profile (Figure 3) demonstrates what is common knowledge — during rare hydrologic events a substantial amount of water passes over the access road. However, replacement of the existing culverts, which are functionally inadequate and increasing the profile grade of the access road and its approaches to an elevation of about 4408–4410 ft results in the water-surface profiles presented on Figures 3 and 4. For those scenarios the Base Flood Event (100-year event) is conveyed by the structures.

From a hydraulic perspective, the clear span bridge is the preferable approach, although it is slightly more costly to construct. The advantage is that no supporting pier is required in the channel. Therefore, the potential for the accumulation of transported woody debris and sediment reducing the hydraulic capacity of the structure is reduced. This is in contrast to the double ConSpan (pre-fabricated concrete arch culvert), which will have a center structure that could trap floating debris and cause a reduction in flow capacity.

For the clear-span bridge, the low-chord elevation will be approximately 4407 ft. The bed elevation of Clover Creek is about 4394.1 ft. Therefore, the clear open is at about 13 ft. In addition, because of the potential for local scour, the abutment foundations should be placed relatively deep. The exact depth below the channel bed for the abutment foundations should be determined during the detailed design phase of the project using scour estimates appropriate for the site and channel materials present at the site.

Results from the 500-year flood are also depicted on the water-surface profiles. Although the proposed bridge affords a minor reduction in the water-surface elevation for the 500-year event, the major benefit derives from preservation of the crossing (it is unlikely it will be significantly damaged by 500-year flood flows) and the relocation of the water and sewage collection lines, which are no longer threatened in the event of overtopping of the CYC access road. It is unlikely that the proposed structure will have substantial benefits to flood damage with this exception.

In its current configuration, the CYC access road behaves as a sediment trap. At least a portion of the sediments moving downstream from the Clover Creek watershed are trapped by the pool formed by the CYC access road during hydrologic events. This condition is not natural. That is, before construction of the access road, sediments moving from the watershed through Clover Creek were unimpeded through this reach of Clover Creek. When the CYC access road is improved with additional conveyance, sediments will once again be able to move through the structure in the downstream direction. This situation does not represent an increase in sediment delivery above the natural condition; it represents a return to approximately the natural state wherein incoming sediments will pass through the structure without significant deposition upstream from the crossing.

Velocity through the proposed bridge is approximately that of the channel flows upstream and downstream from the structure. Therefore, there should be little or no general scour associated with the structure, although local scour might occur at the abutments.

The important point to this description is that it is not anticipated that the hydraulic improvements will generate sediment movement downstream in excess of the natural (before the CYC access road) sediment delivery rate, especially once the system regains dynamic equilibrium.

To partly mitigate the potential for motion of sediments stored in the channel upstream from the CYC access road, a grade control structure was proposed upstream from the CYC access road site. The purpose of this structure and its design were described in the report by Sunrise Engineering (Philips, 2008). The grade control structure should be included in the project because improvement of flow conditions at the CYC access road crossing could result in a change of base level of the stream bid, resulting in a headcut in the upstream direction. If such a change in base level occurs, it should be controlled to prevent unmitigated erosion of the channel upstream until engineered improvement can be constructed to mitigate damage to the stream banks and nearby floodplain.

Because the proposed grade control structure is to be constructed at the existing grade of the channel and channel banks, it was not included in the preliminary hydraulic modeling of the study reach of Clover Creek. However, the impact of the grade control structure on reach hydraulics in the current state is expected to be minimal. The structure will only become significant from a hydraulics viewpoint if the Clover Creek base level decreases. Then the structure will serve to impede further decline in base level and addition of the sediment pool upstream to the flow.

According to the Nevada Department of Transportation 2008 Structures Manual (Elicegui and others, 2008), the design life for a bridge structure is 75 years. This is consistent with American Association of State Highway Transportation Organizations (AASHTO) standards. However, the service life of structures is generally less than the design life because of a number of site factors. The FEMA-approved service life of 50 years is appropriate for benefit-cost ratio analysis.

Conclusions

1) Regardless of condition or degree of maintenance, the existing double 12 ft diameter culvert system is inadequate to convey flood flows from events greater than the 10-year recurrence interval beneath the CYC access road.

2) Based on a preliminary hydraulic analysis, two viable alternatives were developed for mitigating overtopping of the Caliente Youth Center access road during relatively rare hydrologic events. The first alternative is use of a double 42'x12' ConSpan pre-fabricated concrete arch culvert and the second is use of a 70' clear span (effective) pre-fabricated bridge. Although the double ConSpan provides sufficient hydraulic capacity to convey flood flows, the drawback is that a portion of the structure would be within the stream channel of Clover Creek. This creates a risk that woody debris and sediment could be trapped during a flood event, reducing the hydraulic capacity sufficiently to cause overtopping of the CYC access road, the circumstance to be mitigated.

3) Therefore, although the cost is slightly greater, it is recommended that a prefabricated bridge with a clear span of 90 ft be used to completely span the Clover Creek channel, thereby reducing the likelihood that debris and sediment will be trapped with the commensurate reduction in hydraulic capacity.

4) Use of the proposed bridge will not result in substantial reduction of the Base Flood Elevation for the impacted reach. The reduction in water-surface elevation is only a few tenths of a foot. This is because of the FEMA assumption that both watersheds simultaneously produce peak discharges at the confluence just downstream from the project site. The probability of this occurring is substantially less than one percent. However, it is the mechanic that FEMA uses for FEMA-required hydrologic and hydraulic analyses. Actually, if a Base Flood Event

occurs on Clover Creek, then it is likely that the water-surface elevation at the CYC crossing will be between two and three feet less than would occur under existing conditions. This is a substantial improvement over the existing condition and should be pursued.

5) Use of the proposed bridge will not result in a substantial reduction of the water-surface elevation at the bridge site from the 500-year event. However, the water and sewage collection lines will not be threatened by such an event, as is the existing condition. Furthermore, it is unlikely that substantial damage will occur to the bridge structure and access road in the event of such a rare hydrologic event. However, a loss of service for a relatively short period of time might occur during the period of time the structure is inundated and few the brief period required to clean up any debris deposited and to effect minor repairs to the adjacent roadways.

6) Sediment transport is a concern in this reach of Clover Creek (and Meadow Valley Wash). Construction of hydraulic improvements to the CYC access road over Clover Creek will result in a restoration of sediment transport to approximately the same rate as what existed before construction of the CYC access road and the 12 ft culverts. Velocity through the proposed structure approximates the natural velocity in the Clover Creek channel upstream and downstream from the proposed structure. Improvement of the structure will result in increased velocity upstream from the structure over the current impounded state because water and sediment will be relatively free to move through the improved structure. The proposed grade control structure is intended to reduce the likelihood of an upstream headcut and resulting mobilization of stored sediments in the Clover Creek channel. Those sediments are a result of years of accumulation resulting from decreased hydraulic conveyance through the affected reach of Clover Creek. It is important to note that any increase in sediment transport is unlikely to exceed the natural (pre-culvert) condition. Instead, it is more likely that sediment transport will approximate the natural condition and should result in a return to a dynamic equilibrium of the channel and sediments in the affected reach.

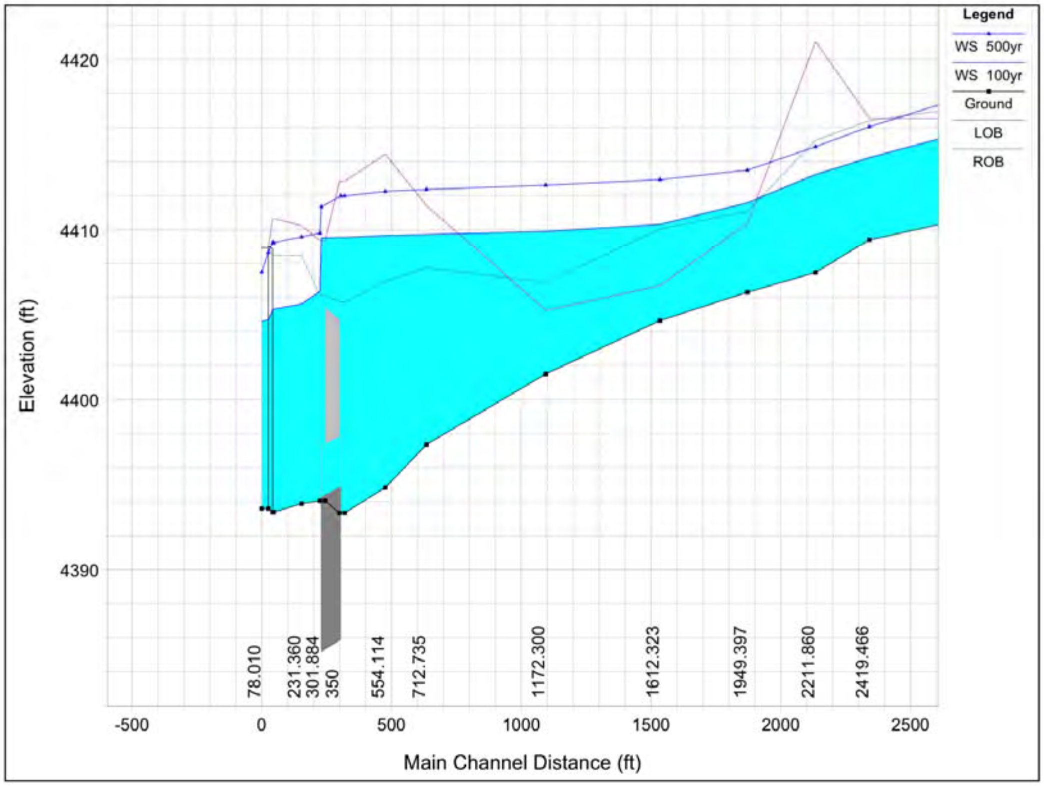


Figure 3. Water-surface profile of Clover Creek at the CYC access road crossing (existing condition) from the FEMA effective model with the assumption that only Clover Creek is in flood condition.

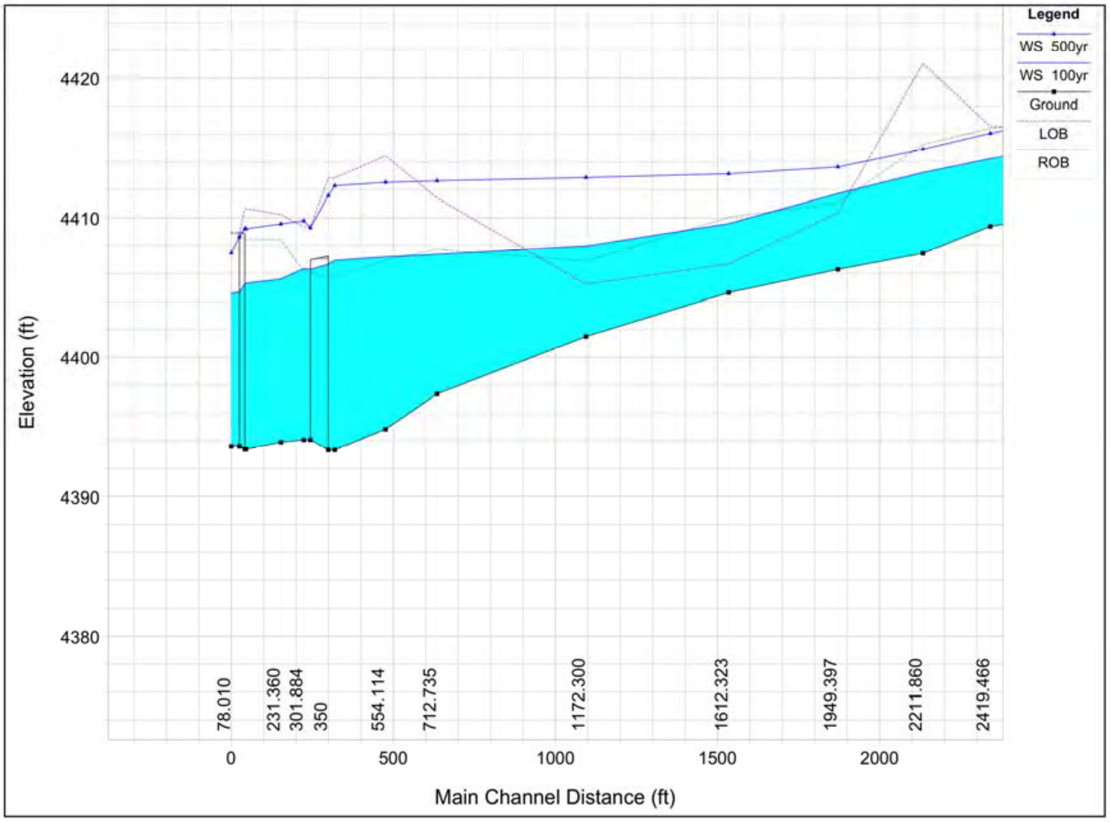


Figure 4. Water-surface profile of Clover Creek at the CYC access road crossing using a pre-fabricated clear-span bridge (proposed condition).

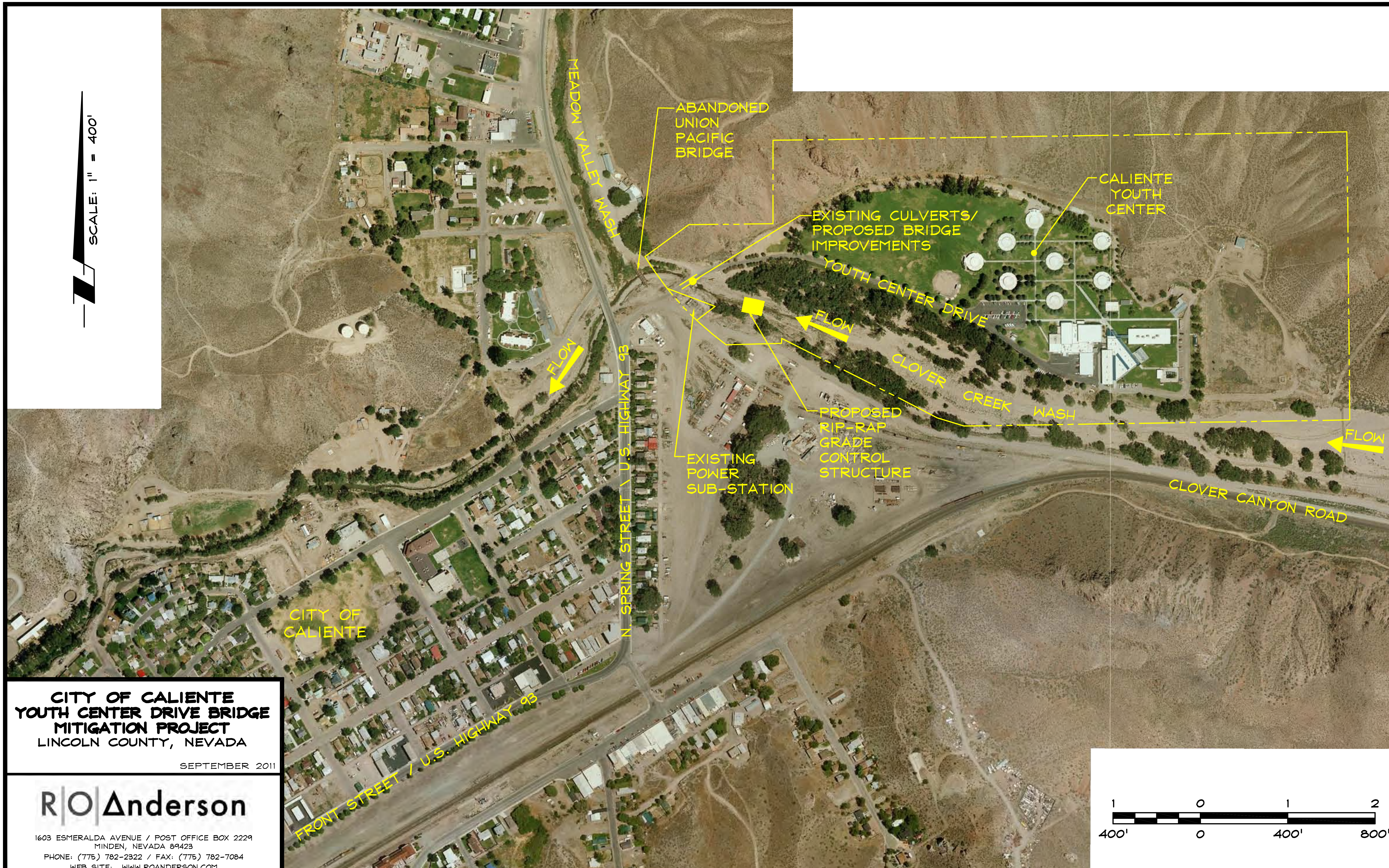
References

Elicegui, Mark, Stefonowicz, Todd, and Severns, David, 2008. Structures Manual, Nevada Department of Transportation, Carson City, Nevada.

HDR, 2008. Task Order 28: Hydrologic analyses and results for the Meadow Valley Wash and Clover Creek Flood Insurance Study, Lincoln County, Nevada. FEMA, Oakland, California.

Phillips, Joseph K. and Rehn, Charles, 2008. “Meadow Valley Wash linear park improvements, hydrologic, hydraulic, sediment analysis, City of Caliente, Nevada,” engineer’s report, Sunrise Engineering, Draper Utah.

Kilgore, Roget T., Thompson, David B., and Ford, David T., 2010. “Estimating joint probabilities of design coincident flows at stream confluences,” Draft report 15–36, National Cooperative Highway Research Program, Washington D.C., 258pp.



CITY OF CALIENTE
YOUTH CENTER DRIVE BRIDGE MITIGATION PROJECT
LINCOLN COUNTY, NEVADA

SEPTEMBER 2011

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MINDEN, NEVADA 89423
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WEB SITE: WWW.ROANDERSON.COM

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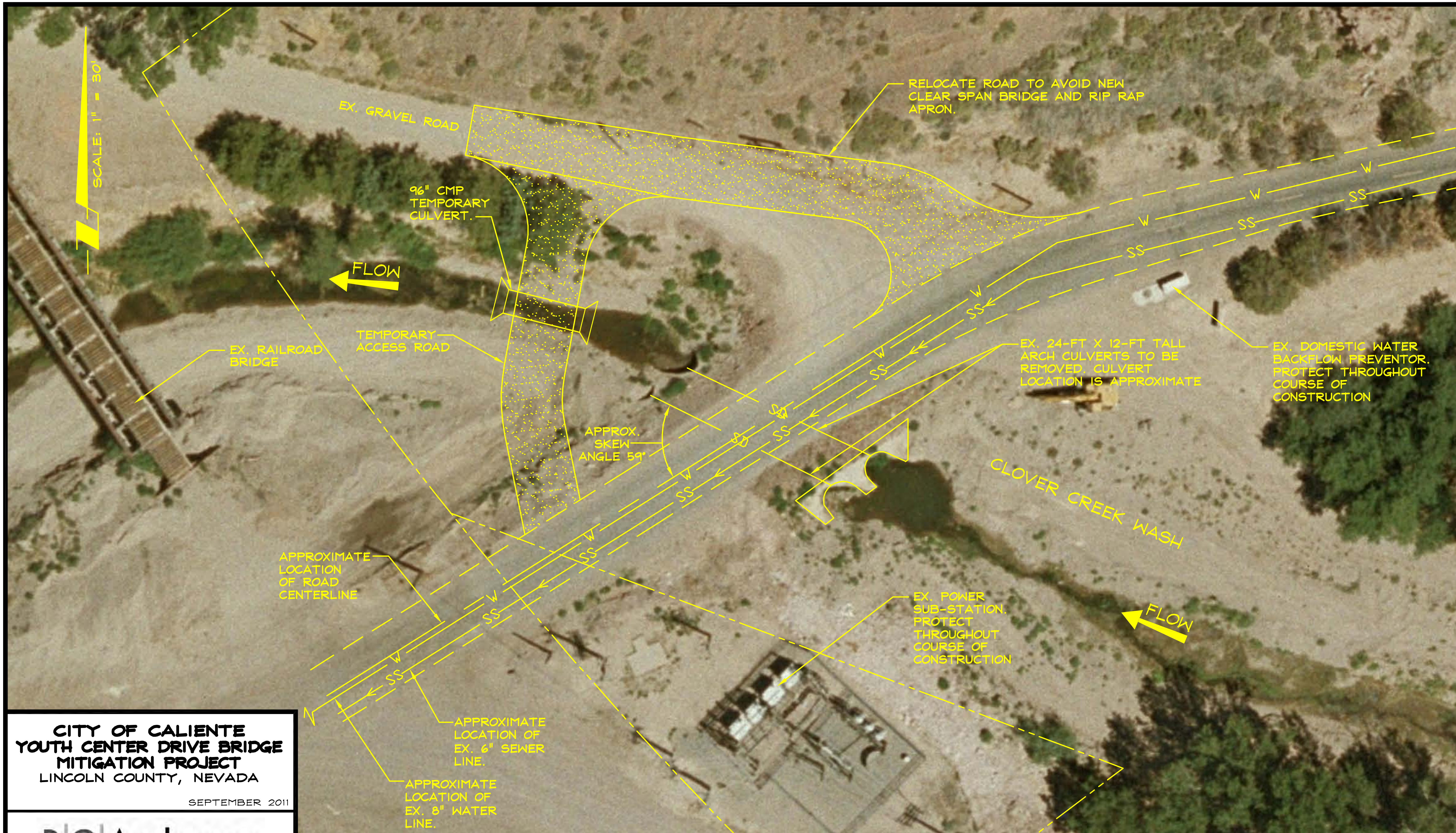

CITY OF CALIENTE
YOUTH CENTER DRIVE BRIDGE MITIGATION PROJECT
LINCOLN COUNTY, NEVADA

SEPTEMBER 2011

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EXISTING SITE & DEMOLITION PLAN

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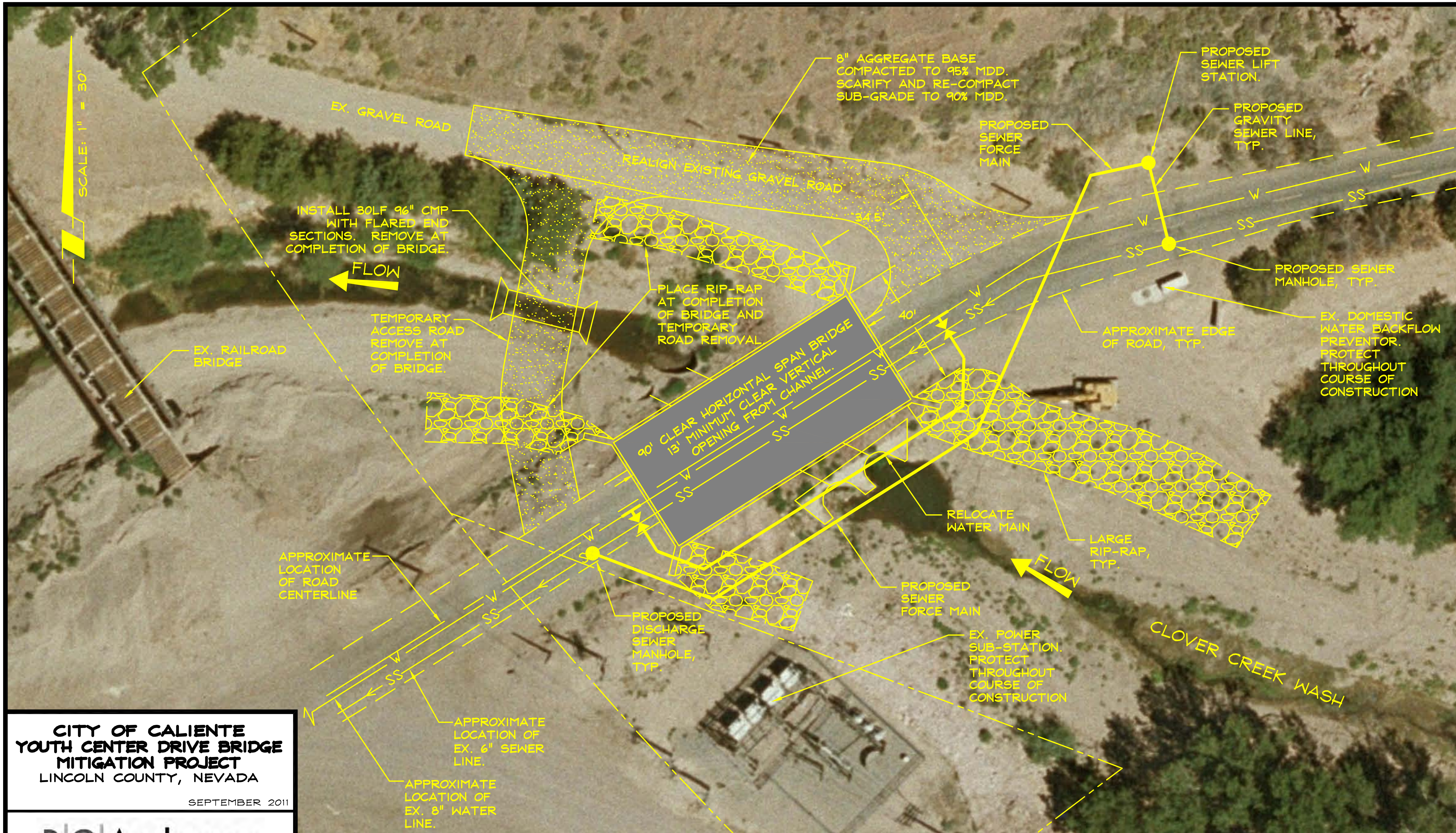

CITY OF CALIENTE
YOUTH CENTER DRIVE BRIDGE MITIGATION PROJECT
LINCOLN COUNTY, NEVADA

SEPTEMBER 2011

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SITE PLAN

SCALE: 1" = 30'

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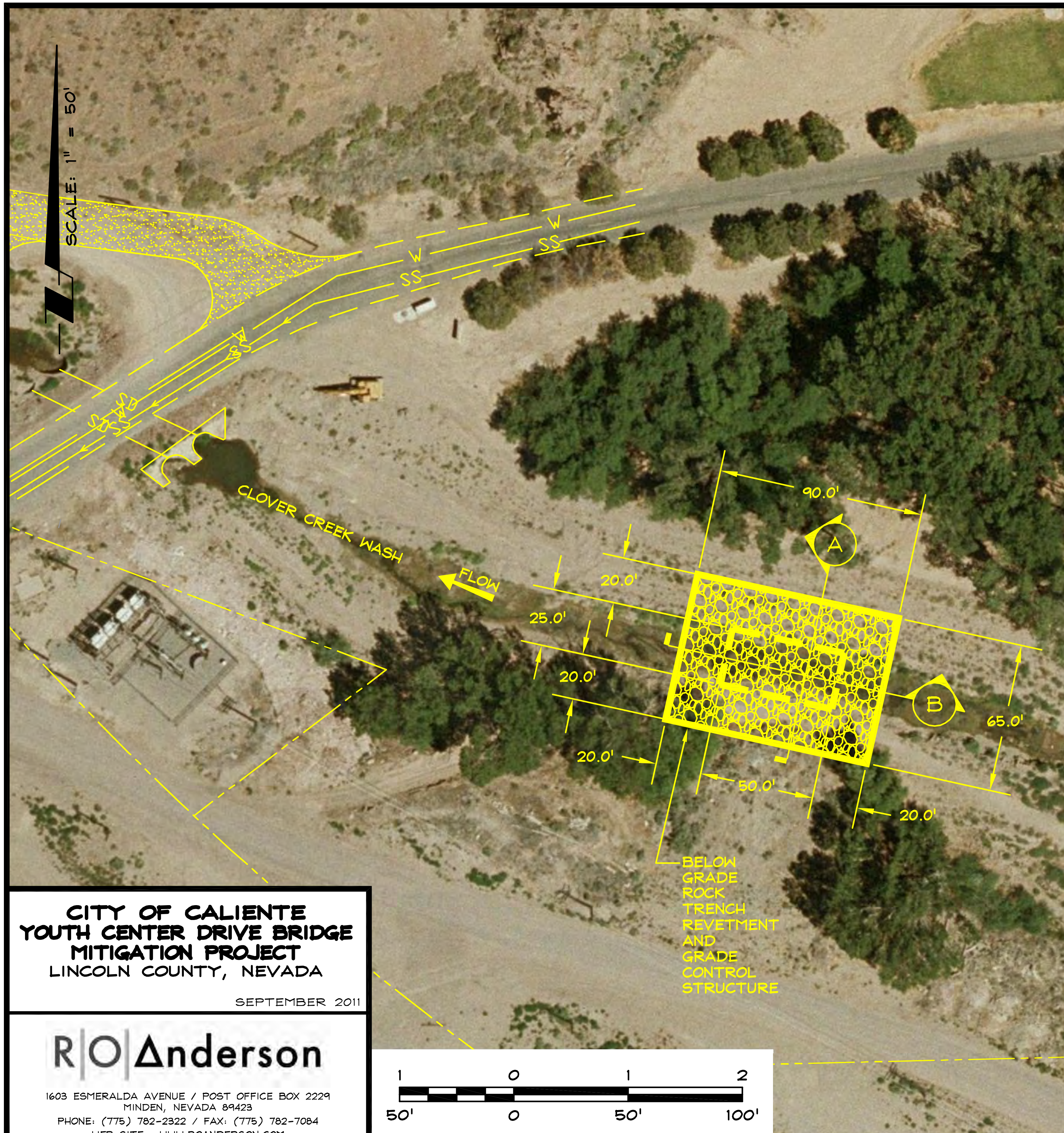
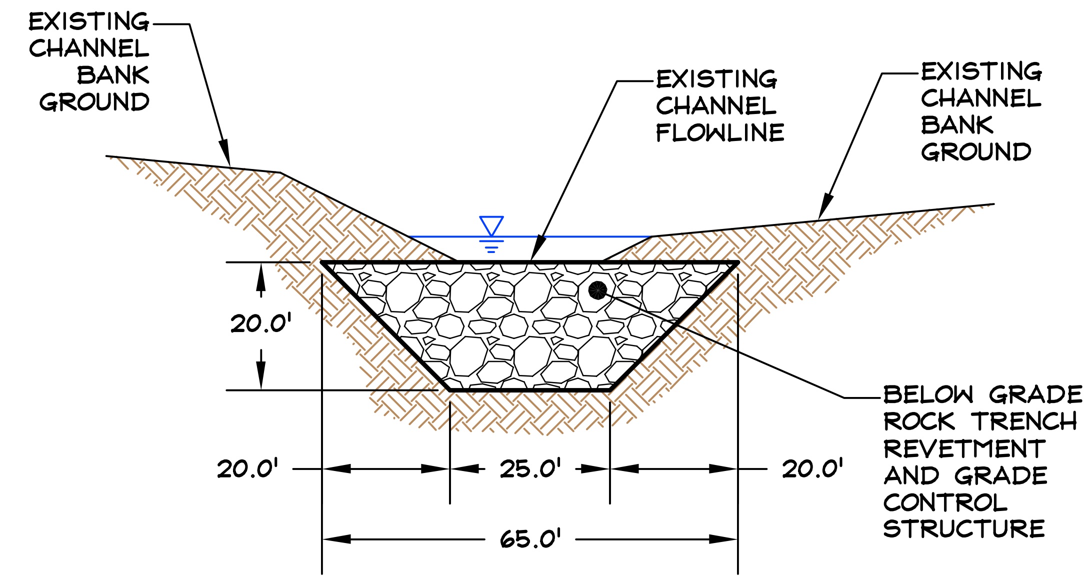
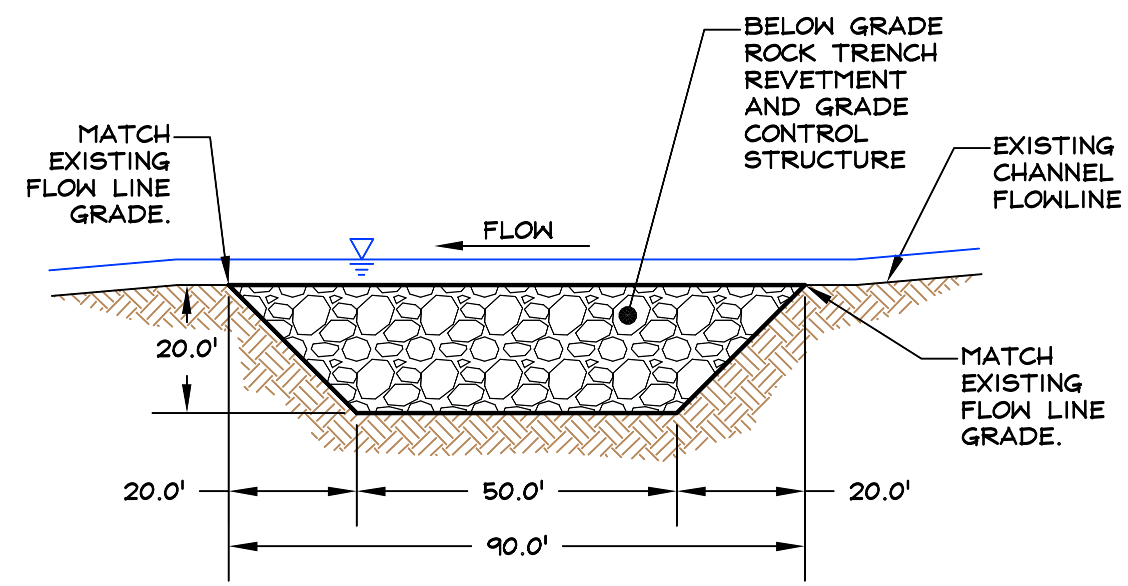




SECTION A

NO SCALE



SECTION B

NO SCALE

CITY OF CALIENTE
YOUTH CENTER DRIVE BRIDGE MITIGATION PROJECT

LINCOLN COUNTY, NEVADA

SEPTEMBER 2011

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Appendix E – Cultural Resources Inventory

U.S. Department of Homeland Security
Region IX
1111 Broadway, Suite 1200
Oakland, CA 94607-4052

FEMA

September 4, 2013

Ms. Rebecca L. Palmer
State Historic Preservation Officer
Office of Historic Preservation
901 South Stewart Street, Suite 5004
Carson City, NV 89701-5248

RE: PDM-PJ-09-NV-2012-002
State of Nevada Public Works Division

Dear Ms. Palmer:

The Federal Emergency Management Agency (FEMA) is considering an application to provide financial assistance (Undertaking) through the Pre-Disaster Grant Program (PDM) through the State of Nevada Division of Emergency Management (Grantee) to the State of Nevada Public Works Division to remove existing culverts and replace them with a new bridge structure just east of the confluence of Clover Creek Wash and Meadow Valley Wash in the incorporated City of Caliente, Lincoln County, Nevada. The new bridge would allow for sufficient flows in Clover Creek to pass during flood events and maintain access to the north side of the wash during high water. The structure would be 90 feet long with a width of 40 feet. It would span the entire width of the channel and would not require piers to be constructed in the channel but would include bridge approaches, abutments, wingwalls, and bank amoring.

The project site is located at Caliente Youth Center Drive, Caliente, Lincoln County. Youth Center Drive is the single point of access to both the Caliente Youth Center and the Hot Springs Hotel. FEMA has been identified an Area of Potential Effect (APE) in accordance with 36 CFR Part 800.4(a)(1) and the Programmatic Agreement executed between FEMA, the NVSHPO, and the Nevada Division of Emergency Management as the entire construction footprint of the proposed project area.

FEMA's Subapplicant has performed a Class III Cultural Resources Inventory of 6.2 acres for the proposed project which has been enclosed for your review. FEMA has made a finding of no historic properties affected pursuant to 36 CFR Part 800.4(d)(1). We have enclosed documentation in support of our finding in accordance with 36 CFR Part 800.11(d).

We seek your concurrence with our finding. FEMA will proceed with the Undertaking unless you notify FEMA of your non-concurrence within 30 days of receipt of our determination. If you have any questions or require additional information please do not hesitate to contact me at (510) 627-7728 or donna.meyer@dhs.gov.

Sincerely,

Donna M. Meyer, CEM/HPS
Deputy Regional Environmental Officer
Non-Disaster Grant Programs

Enclosure

CALIENTE YOUTH CENTER BRIDGE FLOOD MITIGATION DOCUMENTATION – NO HISTORIC PROPERTIES AFFECTED
September 2013

1) A description of the undertaking, specifying the Federal involvement, and its area of potential effects, including photographs, maps, drawings, as necessary;

The Federal Emergency Management Agency (FEMA) intends to provide financial assistance (Undertaking) through its Pre-Disaster Mitigation Grant Program (PDM) to the State of Nevada Public Works Division through the Nevada Division of Emergency Management to remove the existing twelve-foot diameter half-pipe culverts and concrete headwall and replace the existing culverts with a spanning structure (bridge) with sufficient capacity to allow passage of the 100-year flood event and associated sediment and debris without overtopping the access road. As part of the proposed project approximately 2,500 square feet of existing pavement would be removed and approximately 3,050 cubic yards of earthwork would be excavated and graded at the location of the exiting culverts and adjacent banks. To facilitate the construction a temporary graded road is necessary to provide access to existing uses upstream of the proposed project site. Staging areas would be located within paved and other previously disturbed areas near the proposed project area.

The Area of Potential Effect (APE) has been identified by FEMA as the entire construction footprint of the proposed project site. The proposed project is not expected to result in any adverse visual, atmospheric or audible effects outside of the direct APE and thus an indirect APE was not established.

2) A description of the steps taken to identify historic properties, including, as appropriate, efforts to seek information pursuant to § 800.4(b)

A search of the National Register of Historic Places (NRHP) was performed as well as the review of several other on-line resources. In addition, the Subapplicant's consultant prepared and performed a Phase III Cultural Resources Inventory of the proposed project area.

3) The basis for determining that no historic properties are present or affected

There were no historic properties identified within or adjacent to the APE meeting criteria pursuant to 36 CFR Part 60.4 eligible for listing to the NRHP. FEMA has determined that construction activities associated with culvert replacement and construction of the new spanning bridge structure would have no effect on historic properties pursuant to 36 CFR Part 800.

LEO M. DROZDOFF, P.E.
Director
Department of Conservation and National Resources

REBECCA L PALMER
State Historic Preservation Officer

BRIAN SANDOVAL
Governor

STATE OF NEVADA

Address Reply to:
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www.nvshpo.org

DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION OFFICE

January 3, 2014

Donna M. Meyer, DEM/HPS
Deputy Regional Environmental Officer
Non-Disaster Grant Programs
US Department of Homeland Security
Federal Emergency Management Agency
1111 Broadway, Suite 1200
Oakland, CA 94607-4052

RE: Removal of Culverts and Bridge Replacement in the incorporated City of Caliente, Lincoln County, Nevada.
PDM-PJ-09-NV-2012-002/ Undertaking #2013-2858.

Dear Ms. Meyer:

The Nevada State Historic Preservation Office (SHPO) has reviewed the subject undertaking in compliance with Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended.

The SHPO concurs with the Federal Emergency Management Agency's (FEMA) determination of the area of potential effects (APE) for both direct and indirect effects for the above-mentioned undertaking.

The SHPO concurs with the FEMA's determination that cultural resource 26LN6830 is not eligible for the National Register of Historic Places under any of the Secretary's criteria.

The FEMA is deferring a determination of National Register eligibility for C& P Railroad Bridge (S1041) pending additional research.

The SHPO concurs with the FEMA's determination that the proposed undertaking will not have an adverse effect to the above-mentioned unevaluated cultural resource as it is within the indirect APE only and the effects will not rise to an adverse effect based on the submitted documents.

Should you have any questions concerning this correspondence, please contact Jessica Axsom at (775)684-3445 or by e-mail at jaxsom@shpo.nv.gov .

Sincerely,

Rebecca Lynn Palmer
State Historic Preservation Officer

1927-003

U.S. Department of Homeland Security
Region IX
1111 Broadway, Suite 1200
Oakland, CA 94607-4052

FEMA

September 5, 2013

Mr. Ed Naranjo
Tribal Chairman
Goshute Tribal Council
P.O. Box 140068
195 Tribal Center Road
Ibapah, UT 84034

RE: FEMA PDM-PJ-09-NV-2012-002
State of Nevada Public Works Division

Dear Chairman Naranjo:

Section 101(d)(6)(B) of the National Historic Preservation Act of 1966 as amended requires the Department of Homeland Security – Federal Emergency Management Agency (FEMA) to consult with any Indian Tribe that may attach religious and cultural significance to historic properties that may be affected by a FEMA Undertaking. FEMA is considering a Pre-Disaster Mitigation (PDM) grant thorough the Nevada Department of Emergency Management to the State of Nevada Public Works Division to remove existing culverts and replace them with a new bridge structure just east of the confluence of Clover Creek and Meadow Valley Wash in the incorporated City of Caliente, Lincoln County, Nevada. The new bridge would allow for sufficient flows in Clover Creek to pass during flood events and maintain access to the north side of the wash during high water.

FEMA has identified an Area of Potential Effect (APE) as the entire construction footprint for the new bridge. Because potential direct and indirect impacts of the Subapplicant's proposal may have an effect on historic properties we respectfully request your interest regarding the proposal; any comments regarding identification of the Area of Potential Effect (APE); historic properties; advise us on the identification, evaluation, and eligibility of any historic properties including those of traditional religious and cultural importance; articulate your views of the Subapplicant's proposal

and FEMA's subsequent Undertaking of providing grant assistance on such historic properties; and, to participate in the resolution of any adverse effects.

We will condition the grant so that if any historic properties are encountered during construction all work would cease and the Subapplicant would be required to contact FEMA, the Tribe, and the State Historic Preservation Officer. If you have any questions or require additional information please do not hesitate to contact me at (510) 627-7728, the letterhead address above or donna.meyer@fema.dhs.gov.

Sincerely,

Donna M. Meyer, CEM/HPS
Deputy Regional Environmental Officer
Non-Disaster Grant Programs

Enclosure

cc: Ms. Phyllis Naranjo, Tribal Secretary (w/o enclosure)

1927-003

U.S. Department of Homeland Security
Region IX
1111 Broadway, Suite 1200
Oakland, CA 94607-4052

FEMA

September 5, 2013

Ms. Virginia Sanchez
Tribal Chairperson
Duckwater Sho-Pai Tribes
P.O. Box 140068
Duckwater, NV 89314

RE: FEMA PDM-PJ-09-NV-2012-002
State of Nevada Public Works Division

Dear Chairperson Sanchez:

Section 101(d)(6)(B) of the National Historic Preservation Act of 1966 as amended requires the Department of Homeland Security – Federal Emergency Management Agency (FEMA) to consult with any Indian Tribe that may attach religious and cultural significance to historic properties that may be affected by a FEMA Undertaking. FEMA is considering a Pre-Disaster Mitigation (PDM) grant thorough the Nevada Department of Emergency Management to the State of Nevada Public Works Division to remove existing culverts and replace them with a new bridge structure just east of the confluence of Clover Creek and Meadow Valley Wash in the incorporated City of Caliente, Lincoln County, Nevada. The new bridge would allow for sufficient flows in Clover Creek to pass during flood events and maintain access to the north side of the wash during high water.

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Sincerely,

Donna M. Meyer, CEM/HPS
Deputy Regional Environmental Officer
Non-Disaster Grant Programs

Enclosure

cc: Ms. Patricia Knight, Tribal Manager (w/o enclosure)

1927-003

U.S. Department of Homeland Security
Region IX
1111 Broadway, Suite 1200
Oakland, CA 94607-4052

FEMA

September 5, 2013

Mr. William Anderson
Chairman
Moapa Band of Paiutes
1 Lincoln Street
P.O. Box 340
Moapa Springs, NV 89025

RE: FEMA PDM-PJ-09-NV-2012-002
State of Nevada Public Works Division

Dear Chairman Anderson:

Section 101(d)(6)(B) of the National Historic Preservation Act of 1966 as amended requires the Department of Homeland Security – Federal Emergency Management Agency (FEMA) to consult with any Indian Tribe that may attach religious and cultural significance to historic properties that may be affected by a FEMA Undertaking. FEMA is considering a Pre-Disaster Mitigation (PDM) grant thorough the Nevada Department of Emergency Management to the State of Nevada Public Works Division to remove existing culverts and replace them with a new bridge structure just east of the confluence of Clover Creek and Meadow Valley Wash in the incorporated City of Caliente, Lincoln County, Nevada. The new bridge would allow for sufficient flows in Clover Creek to pass during flood events and maintain access to the north side of the wash during high water.

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Sincerely,

Donna M. Meyer, CEM/HPS
Deputy Regional Environmental Officer
Non-Disaster Grant Programs

Enclosure

cc: Mr. Eric Lee, Acting Chairman (w/o enclosure)
Ms. Yevette Chevalier, Tribal Administrator (w/o enclosure)

1927-003

U.S. Department of Homeland Security
Region IX
1111 Broadway, Suite 1200
Oakland, CA 94607-4052

FEMA

September 5, 2013

Ms. Tonia Means
Chairperson
Las Vegas Tribe of Paiute Indians of the Las Vegas Indian Colony
Number One Paiute Drive
Las Vegas, NV 89106

RE: FEMA PDM-PJ-09-NV-2012-002
State of Nevada Public Works Division

Dear Chairperson Means:

Section 101(d)(6)(B) of the National Historic Preservation Act of 1966 as amended requires the Department of Homeland Security – Federal Emergency Management Agency (FEMA) to consult with any Indian Tribe that may attach religious and cultural significance to historic properties that may be affected by a FEMA Undertaking. FEMA is considering a Pre-Disaster Mitigation (PDM) grant thorough the Nevada Department of Emergency Management to the State of Nevada Public Works Division to remove existing culverts and replace them with a new bridge structure just east of the confluence of Clover Creek and Meadow Valley Wash in the incorporated City of Caliente, Lincoln County, Nevada. The new bridge would allow for sufficient flows in Clover Creek to pass during flood events and maintain access to the north side of the wash during high water.

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and FEMA's subsequent Undertaking of providing grant assistance on such historic properties; and, to participate in the resolution of any adverse effects.

We will condition the grant so that if any historic properties are encountered during construction all work would cease and the Subapplicant would be required to contact FEMA, the Tribe, and the State Historic Preservation Officer. If you have any questions or require additional information please do not hesitate to contact me at (510) 627-7728, the letterhead address above or donna.meyer@fema.dhs.gov.

Sincerely,

Donna M. Meyer, CEM/HPS
Deputy Regional Environmental Officer
Non-Disaster Grant Programs

Enclosure

1927-003

U.S. Department of Homeland Security
Region IX
1111 Broadway, Suite 1200
Oakland, CA 94607-4052

FEMA

September 5, 2013

Mr. Wayne Dyer
Chairman
Yomba Shoshone Tribe of the Yomba Reservation
HC61, Box 6275
Austin, NV 89310

RE: FEMA PDM-PJ-09-NV-2012-002
State of Nevada Public Works Division

Dear Chairman Dyer:

Section 101(d)(6)(B) of the National Historic Preservation Act of 1966 as amended requires the Department of Homeland Security – Federal Emergency Management Agency (FEMA) to consult with any Indian Tribe that may attach religious and cultural significance to historic properties that may be affected by a FEMA Undertaking. FEMA is considering a Pre-Disaster Mitigation (PDM) grant thorough the Nevada Department of Emergency Management to the State of Nevada Public Works Division to remove existing culverts and replace them with a new bridge structure just east of the confluence of Clover Creek and Meadow Valley Wash in the incorporated City of Caliente, Lincoln County, Nevada. The new bridge would allow for sufficient flows in Clover Creek to pass during flood events and maintain access to the north side of the wash during high water.

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Sincerely,

Donna M. Meyer, CEM/HPS
Deputy Regional Environmental Officer
Non-Disaster Grant Programs

Enclosure

1927-003

U.S. Department of Homeland Security
Region IX
1111 Broadway, Suite 1200
Oakland, CA 94607-4052

FEMA

September 5, 2013

Mr. Manuel Savala
Chairman
Kaibab Band of Paiute Indians of the Kaibab Indian Reservation
HC65, Box 2
Fredonia, AZ 86022

RE: FEMA PDM-PJ-09-NV-2012-002
State of Nevada Public Works Division

Dear Chairman Savala:

Section 101(d)(6)(B) of the National Historic Preservation Act of 1966 as amended requires the Department of Homeland Security – Federal Emergency Management Agency (FEMA) to consult with any Indian Tribe that may attach religious and cultural significance to historic properties that may be affected by a FEMA Undertaking. FEMA is considering a Pre-Disaster Mitigation (PDM) grant thorough the Nevada Department of Emergency Management to the State of Nevada Public Works Division to remove existing culverts and replace them with a new bridge structure just east of the confluence of Clover Creek and Meadow Valley Wash in the incorporated City of Caliente, Lincoln County, Nevada. The new bridge would allow for sufficient flows in Clover Creek to pass during flood events and maintain access to the north side of the wash during high water.

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Sincerely,

Donna M. Meyer

Donna M. Meyer, CEM/HPS
Deputy Regional Environmental Officer
Non-Disaster Grant Programs

Enclosure

1927-003

U.S. Department of Homeland Security
Region IX
1111 Broadway, Suite 1200
Oakland, CA 94607-4052

FEMA

September 5, 2013

Mr. Bryan Cassadore
Chairman
Te-Moak Tribe of Western Shoshone Indians of Nevada
525 Sunset Street
Elko, NV 89801

RE: FEMA PDM-PJ-09-NV-2012-002
State of Nevada Public Works Division

Dear Chairman Cassadore:

Section 101(d)(6)(B) of the National Historic Preservation Act of 1966 as amended requires the Department of Homeland Security – Federal Emergency Management Agency (FEMA) to consult with any Indian Tribe that may attach religious and cultural significance to historic properties that may be affected by a FEMA Undertaking. FEMA is considering a Pre-Disaster Mitigation (PDM) grant thorough the Nevada Department of Emergency Management to the State of Nevada Public Works Division to remove existing culverts and replace them with a new bridge structure just east of the confluence of Clover Creek and Meadow Valley Wash in the incorporated City of Caliente, Lincoln County, Nevada. The new bridge would allow for sufficient flows in Clover Creek to pass during flood events and maintain access to the north side of the wash during high water.

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Sincerely,

Donna M. Meyer, CEM/HPS
Deputy Regional Environmental Officer
Non-Disaster Grant Programs

Enclosure

1927-003

U.S. Department of Homeland Security
Region IX
1111 Broadway, Suite 1200
Oakland, CA 94607-4052

FEMA

September 5, 2013

Mr. Alvin S. Marques
Tribal Chairman
Ely Shoshone Tribe
16 Shoshone Circle
Ely, NV 89301

RE: FEMA PDM-PJ-09-NV-2012-002
State of Nevada Public Works Division

Dear Chairman Marques:

Section 101(d)(6)(B) of the National Historic Preservation Act of 1966 as amended requires the Department of Homeland Security – Federal Emergency Management Agency (FEMA) to consult with any Indian Tribe that may attach religious and cultural significance to historic properties that may be affected by a FEMA Undertaking. FEMA is considering a Pre-Disaster Mitigation (PDM) grant thorough the Nevada Department of Emergency Management to the State of Nevada Public Works Division to remove existing culverts and replace them with a new bridge structure just east of the confluence of Clover Creek and Meadow Valley Wash in the incorporated City of Caliente, Lincoln County, Nevada. The new bridge would allow for sufficient flows in Clover Creek to pass during flood events and maintain access to the north side of the wash during high water.

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Sincerely,

Donna M. Meyer, CEM/HPS
Deputy Regional Environmental Officer
Non-Disaster Grant Programs

Enclosure

cc: Ms. Sandra Barela, Tribal Coordinator (w/o enclosure)

1927-003

U.S. Department of Homeland Security
Region IX
1111 Broadway, Suite 1200
Oakland, CA 94607-4052

FEMA

September 5, 2013

Ms. Jeanine Borchardt
Chairwoman
Paiute Indian Tribe of Utah
440 N. Paiute Drive
Cedar City, UT 84721

RE: FEMA PDM-PJ-09-NV-2012-002
State of Nevada Public Works Division

Dear Chairwoman Borchardt:

Section 101(d)(6)(B) of the National Historic Preservation Act of 1966 as amended requires the Department of Homeland Security – Federal Emergency Management Agency (FEMA) to consult with any Indian Tribe that may attach religious and cultural significance to historic properties that may be affected by a FEMA Undertaking. FEMA is considering a Pre-Disaster Mitigation (PDM) grant thorough the Nevada Department of Emergency Management to the State of Nevada Public Works Division to remove existing culverts and replace them with a new bridge structure just east of the confluence of Clover Creek and Meadow Valley Wash in the incorporated City of Caliente, Lincoln County, Nevada. The new bridge would allow for sufficient flows in Clover Creek to pass during flood events and maintain access to the north side of the wash during high water.

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Sincerely,

Donna M. Meyer, CEM/HPS
Deputy Regional Environmental Officer
Non-Disaster Grant Programs

Enclosure

Stephanie Hicks

From: Meyer, Donna <Donna.Meyer@fema.dhs.gov>
Sent: Tuesday, September 10, 2013 8:25 AM
To: Stephanie Hicks
Subject: FW: RE:FEMA PDM-PJ-09-NV-2012-002

For the Appendix

Donna M. Meyer, CEM,HPS
Deputy Regional Environmental Officer
FEMA Region IX
1111 Broadway, Suite 1200
Oakland, CA 94607
(510) 627-7728
donna.meyer@fema.dhs.gov

From: ed naranjo [mailto:ednaranjo@goshutetribe.com]
Sent: Tuesday, September 10, 2013 8:23 AM
To: Meyer, Donna
Subject: RE:FEMA PDM-PJ-09-NV-2012-002

The Confederated Tribes of the Goshute Reservation has reviewed the Cultural Resources Inventory for the Caliente Youth Center Flood Mitigation Project. We have no issues or concerns regarding the project. However, should there be any discoveries that are of Native

September 18, 2013

Dear Ms. Meyer,

Subject: ***Caliente Youth Center Flood Mitigation Project, Lincoln County, Nevada***

The Paiute Indian Tribe of Utah is in receipt of your letter dated September 5, 2013, and has reviewed the material and do not have any objections pertaining to the above named project. At this time we are not aware of any cultural resource sites, practices, but the tribe would like to be kept informed if any cultural resources should be found.
As you are aware the tribes supports the identification and avoidance of prehistoric archaeological sites and traditional cultural properties.

The Paiute Tribe sincerely appreciates the consideration and efforts you and your staff have made to consult with the Tribes.

Sincerely,

Dorena Martineau/Cultural Resource
Paiute Indian Tribe of Utah
440 North Paiute Drive
Cedar City, Utah 84721

Stephanie Hicks

From: Meyer, Donna <Donna.Meyer@fema.dhs.gov>
Sent: Friday, September 27, 2013 9:35 AM
To: Stephanie Hicks
Subject: FW: FEMA PDM-PJ-)(-NV-2012-002 Lincoln County, Caliente Pre-Diaster Mitigation

I am teleworking today and don't have the Project number but I think this is for the Youth Bridge. Thanks.

Donna M. Meyer, CEM, HPS
Deputy Regional Environmental Officer
FEMA – Region IX
1111 Broadway, Suite 1200
Oakland, CA 94607
(510) 627-7728
donna.meyer@fema.dhs.gov

From: maurice churchill [mailto:churchill488@hotmail.com]
Sent: Thursday, September 26, 2013 4:04 PM
To: Meyer, Donna
Subject: FEMA PDM-PJ-)(-NV-2012-002 Lincoln County, Caliente Pre-Diaster Mitigation

Dear Ms. Meyer;
In reviewing the above mentioned report that was received in the Duckwater Shoshone Tribe's office on Sept. 9, 2013; this is the response after reading the cultural report and Class 3 field work. It appears there are not any cultural artifacts or culturally significant sites that are connected to the Duckwater Shoshone Tribe. Also, please contact the Southern Pauite Tribes, such as the Moapa Band of Southern Pauites, Kaibab Paauite Tribe, Cedar Band of Southern Pauites or the Kanosh Band of Southern Pauite. Caliente is more in the traditional homeland of the Southern Pauite Tribes.
Thank you for the letter and i look forward to hearing from you soon.
Sincerely,
Maurice Frank-Churchill
Assistant to Division Managers

A Class III Cultural Resources Inventory of 6.2 Acres and Architectural Assessment for the Caliente Youth Center Bridge Flood Mitigation Project, Lincoln County, Nevada

Prepared for:

Stephanie Hicks, AICP
R. O. Anderson
1603 Esmeralda Avenue
Minden, Nevada 89423

Prepared by:

Mark A. Giambastiani,
Leslie R. Fryman,
Shannon Mahoney,
and Samantha Mackowiak

ASM affiliates
archaeology
history
architectural history
ethnography
10 State Street
Reno, Nevada 89501
(775) 324-6789

PN 20610
November 2013

A Class III Cultural Resources Inventory of 6.2 Acres and Architectural Assessment for the Caliente Youth Center Bridge Flood Mitigation Project, Lincoln County, Nevada

Prepared for:

Stephanie Hicks, AICP
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ASM Affiliates, Inc.
10 State Street
Reno, Nevada 89501
(775) 324-6789

PN 20610
November 2013

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MANAGEMENT SUMMARY

On May 25, 2013, ASM Affiliates, Inc. (ASM) conducted a Class III cultural resources inventory of approximately 6.2 acres and an architectural assessment of a historic railroad bridge in the town of Caliente, Lincoln County, Nevada. The work performed by ASM was contracted by R. O. Anderson on behalf of the State Public Works Division as part of the Caliente Youth Center Bridge Flood Mitigation Project (07-S04), which is funded by the State of Nevada. The survey area and the bridge lie at the north end of Caliente, encompassing a portion of Clover Creek Wash at the entrances to the Caliente Youth Center and the Caliente Hot Springs Motel.

Inventory fieldwork was conducted by ASM's Principal Investigator, Mark A. Giambastiani, Ph.D., and an architectural assessment of the bridge was completed by ASM's Historical Archaeologist, Ms. Leslie Fryman, M.A. The inventory resulted in the identification of one highly disturbed archaeological site (26LN6830) consisting of historic refuse dating between ca. 1900 and 1960. The site contains a wide variety of domestic refuse (e.g., bottle glass shards, earthenware ceramic sherds and porcelain sherds, pieces of unidentified metal, ceramic sewer pipe, wire, milled wood, chunks of concrete, sanitary cans, bits of ceramic insulator, cut faunal bone) and appears to represent mixed debris from sediment that is regularly removed from Clover Creek Wash during post-flood dredging activities. The bridge was formerly a feature of the Caliente and Pioche (C&P) Railroad, a branch of the Union Pacific Railroad's Salt Lake Route. Built in 1911, it is a common pony (thru-truss) plate-girder steel bridge supported by an abutment of vertical wooden pilings and a stacked beam-and-tie platform.

As per Section 106 of the National Historic Preservation Act (NHPA), in accordance with its implementing regulations found in 36 Code of Federal Regulations, Part 800 (36 CFR 800), and considering 36 CFR 60.4, archaeological site 26LN6830 was evaluated with respect to its eligibility for listing to the National Register of Historic Places (NRHP). Site 26LN6830 is in tertiary depositional context, has a temporally mixed cultural assemblage, and highly fragmented artifacts. The site is not associated with significant historic events (NRHP Criterion A) or persons of importance in history (Criterion B). It does not embody the distinctive characteristics of a type, period, or method of construction (Criterion C), and cannot offer any useful scientific data regarding historic occupations in Caliente (Criterion D). The site is thus recommended not eligible for NRHP listing under any evaluation criteria.

The C&P Railroad bridge lies outside the project area and will not be affected directly or indirectly by the proposed undertaking. It has been abandoned and isolated for at least 50 years and currently rests on a temporary wooden support structure. The bridge is a very common type of steel bridge manufactured over a long period of time and is unlikely to be eligible for NRHP listing under any evaluation criteria. It remains unevaluated for NRHP eligibility, however, as it does not stand to be impacted in any way by the proposed flood mitigation project.

1. INTRODUCTION

This report documents the results of cultural resources services provided by ASM Affiliates, Inc. (ASM) for the Caliente Youth Center Bridge Flood Mitigation Project (07-S04). On May 25, 2013, ASM conducted an architectural assessment of a historic railroad bridge and a Class III cultural resources inventory of approximately 6.2 acres surrounding a section of Caliente Youth Center Drive in the town of Caliente, Lincoln County, Nevada (Figures 1 and 2). This work was contracted by R. O. Anderson on behalf of the State Public Works Division, as part of preliminary engineering and a grant application to FEMA. The mitigation project will involve the removal of two existing 12-foot (ft.) half-pipe culverts and a concrete headwall that are not of sufficient size or configuration to adequately pass flows, sediment, and debris from even moderate flooding events. The culverts will be replaced by a spanning structure (bridge) that will be able to convey 100-year event flood flows without overtopping the road. In addition, the project will include the relocation of sewer and water infrastructure and improvements to bank stabilization upstream and downstream of the project site, which may require the construction of an upstream grade control structure. The direct Area of Potential Effect (APE) totals roughly 1.45 acres and is fully enveloped by the larger, indirect APE (6.2 acres) that ASM inventoried for cultural resources. The Caliente Youth Center and the historic railroad bridge both lie outside the direct APE of the proposed undertaking but are within the indirect APE/inventoried area.

The project area lies at the north end of Caliente (T4S R67E, Section 8 on the 1881 General Land Office plat and unsectioned on the 1970 USGS Caliente, Nevada 7.5-minute quadrangle), enveloping a portion of Clover Creek Wash and Caliente Youth Center Drive. The north end of the inventoried area is fronted by the entrances to the Caliente Hot Springs Motel (west) and the Caliente Youth Center (east), while the south end extends west to the railroad bridge and east along a paved road that runs parallel to the south edge of Clover Creek Wash. The bed of Clover Creek Wash is broad and partly tree-covered, and is entirely covered with recently and frequently deposited silt and sand. All unpaved ground surfaces elsewhere in the survey area have been graded and consist of fill material used in road building and in the construction of a transformer pad sitting above the south edge of Clover Creek Wash. The railroad bridge has been abandoned, and has no tracks leading to or across it, but is still in use by pedestrians to cross Clover Creek Wash to and from the Caliente Hot Springs Motel.

The intent of this study was to document the presence of any cultural resources in the larger indirect APE/inventoried area and to evaluate them as to their eligibility for listing in the National Register of Historic Places (NRHP), under guidelines set forth in Section 106 of the National Historic Preservation Act (NHPA) and its implementing regulations in 36 Code of Federal Regulations Part 800 (36 CFR 800), and in consideration of 36 CFR 60.4 which defines criteria for evaluating NRHP eligibility. Generally, cultural resources may be considered eligible for NRHP listing if they possess integrity of location, design, setting, materials, workmanship, feeling, and association and meet one or more of the following criteria:

- Criterion A: associated with events that have made a significant contribution to the broad patterns of America’s history
- Criterion B: associated with the lives of persons significant to our past

- Criterion C: embodies the distinctive characteristics of a type, period, or method of construction, or represents the work of a master, or possesses high artistic value, or represents a significant and distinguishable entity whose components may lack individual distinction
- Criterion D: has yielded or may be likely to yield information important in prehistory or history.

This inventory was also completed under the authority of Public Law 91-190, the National Environmental Policy Act of 1969; Public Law 93-291, Preservation of Historic and Archeological Data, amending Public Law 96-523; and the National Historic Preservation Act of 1966, as amended by Public Law 94-43.

This brief report documents the findings of the cultural resource inventory, provides site-specific evaluations of potential eligibility for listing in the NRHP, and assesses the effects of natural and man-made impacts on identified cultural resources. It is divided into five chapters. This brief introduction has summarized the scope and results of the project. Chapter 2 describes the natural setting and cultural context of the project area and then summarizes previous archaeological research in the project area. Chapter 3 describes project methods, while Chapter 4 discusses specific and broader implications of survey results. Finally, Chapter 5 reviews and justifies preliminary NRHP evaluations for all identified cultural resources and outlines recommendations for management actions during the proposed flood mitigation project.

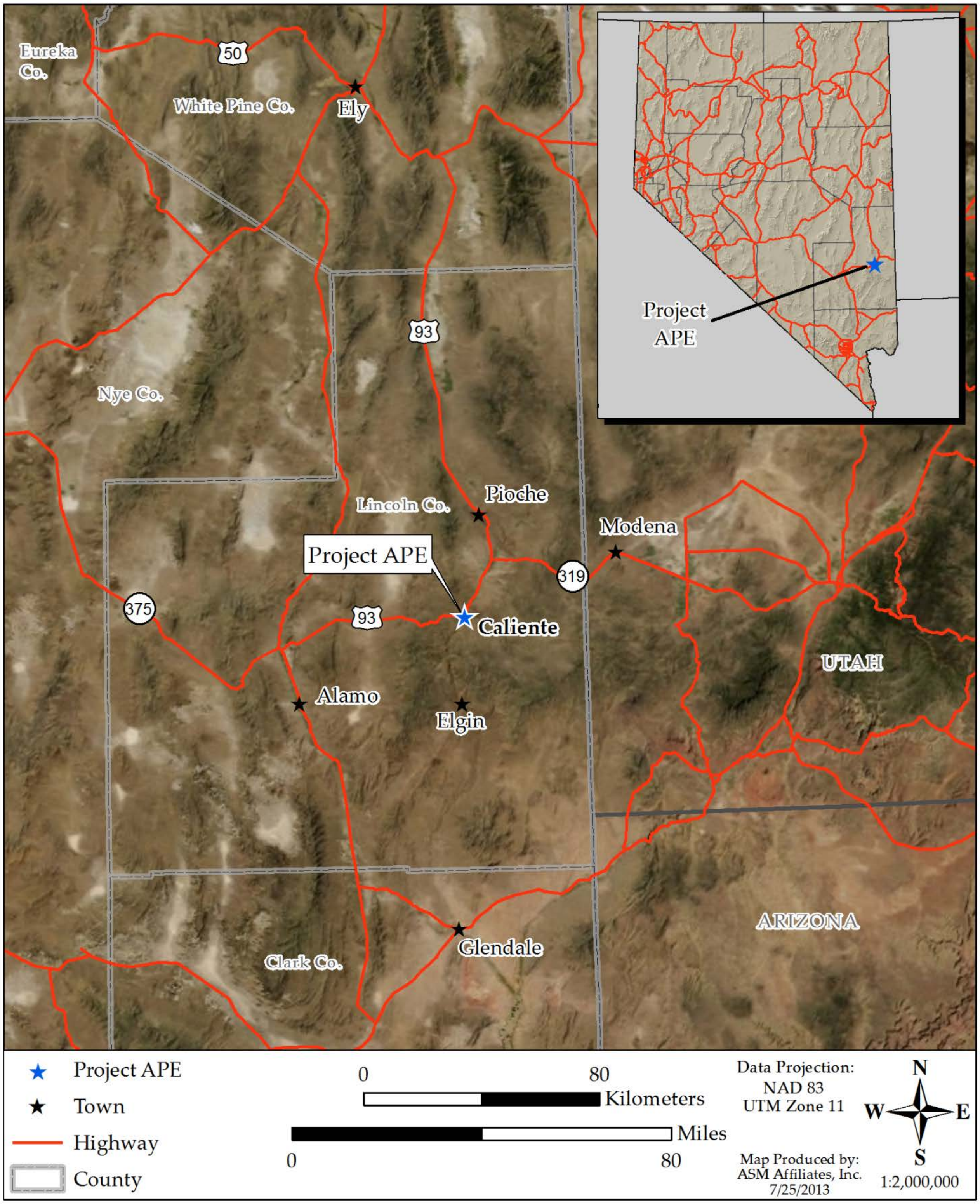

Figure 1. Project vicinity map.

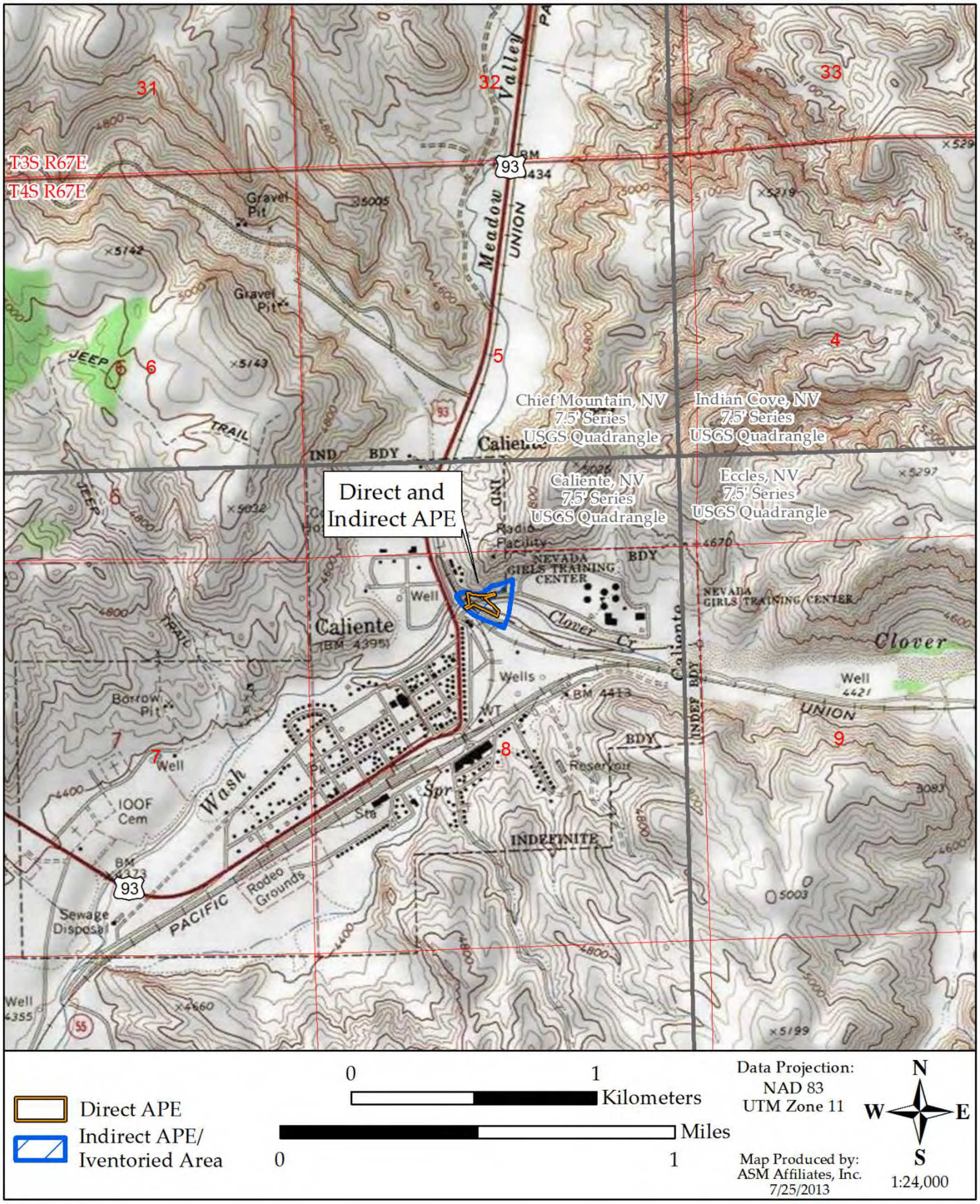

Figure 2. Project APE map, topographic view.

2. PROJECT CONTEXT

Given the limited size of the study, and the fact that findings are restricted to historic-age materials, the present chapter provides only specific, relevant discussions of natural setting and historic context. The former deals only with modern conditions, setting aside the topic of past environments, while the latter is focused on the historic period in Caliente, Nevada.

NATURAL SETTING

The town of Caliente sits at the north end of Rainbow Canyon in Meadow Valley, flanked by the Chief Range to the north, the Delamar Mountains to the west, and the Cedar Range and Clover Mountains to the east. It is also positioned on the north rim of the Caliente Caldera Complex, a group of at least four Miocene caldera clusters dating to about 23 to 15 million years (Rowley et al. 1995). Two major south-flowing drainages, Meadow Valley Wash and Clover Creek Wash, merge within the town limits only a few hundred feet west of the current project area.

Clover Creek Wash runs in a slight northwest direction through the project area (direct and indirect APEs), having descended from Clover Valley east of Caliente. The north edge of the larger indirect APE is fronted by a steep hillslope that runs west and behind the Caliente Hot Springs Motel and northwest of the Caliente Youth Center. Near the north end of the indirect APE there is a small, narrow, rocky spine that juts out from the slope toward Caliente Youth Center Drive (Figure 3).

According to Weide (1982:6), land surfaces within and surrounding the project area are composed of “rhyolitic volcanic” material and include numerous patches of “colluvium, residuum, talus, or scree.” This basement rock is exposed in the rocky spine that descends from the northern hillslope at the north end of the indirect APE. Elsewhere, however, nearly all of the exposed ground surfaces in the project area look to be capped with gravel fill; the lone exception is the grassy area at the entrance to the Caliente Youth Center, which is covered with topsoil and a thin layer of sod. Vegetation is generally absent everywhere except along the northern edge of the indirect APE, where a sparse cover of sagebrush fronts the base of the steep hillslope along Caliente Youth Center Drive, and along the margins and in the bed of Clover Creek Wash where various trees (mostly cottonwoods) and dry grasses are supported.

In the project area, Clover Creek Wash constitutes a broad (100-300 ft.), deep (~20-30 ft.) drainage that is filled with recent alluvium, sand, and silt (Figure 4). Its banks are not reinforced except on both upslope (east) sides and the north downslope side of the half-pipe culverts, where sections of rip-rapped boulders are present. Tree cover is dense east of the culvert but less so to the west, thinning in the vicinity of the railroad bridge. The intersection between Clover Creek Wash and Meadow Valley Wash lies entirely outside the project area, a few hundred feet west of the railroad bridge.

Figure 3. Rocky spine at entrance to Caliente Youth Center; view northeast.

Figure 4. Vegetated bed of Clover Creek Wash; view east.

HISTORIC SETTING

This section provides a brief historic context for the project and its findings in order to help justify NRHP eligibility recommendations provided later in Chapter 4.

Caliente, Nevada

The area surrounding the town of Caliente was originally known as Dutch Flat. It was named after the Dutch Flat Ranch, which was established as early as 1857 and possibly by Philip Klingersmith, renowned for his part in the Meadow Mountains Massacre near Cedar City, Utah (Baker-Denton 1945). In 1860, two refugee slaves, Ike and Dow Barton, came to the area and established the Dow Ranch a few miles east of the junction of Meadow Valley and Clover Creek washes. The Jackman Ranch was established about 1870, operated by brothers Sylvester, Walter, Charles, and "A" (Lincoln County Census 1870). In 1874 William and Charles Culverwell acquired a partial interest in the Jackman Ranch, and in 1879 they purchased the remainder—which became the Culverwell Ranch (Baker-Denton 1945). Until about 1900-1901, Dutch Flat and its surroundings were simply referred to as "Culverwell" (Baker-Denton 1945; Lincoln County Communities Action Team 2013).

In the early 1890s, the Union Pacific Railroad (UPRR) and the San Pedro, Los Angeles and Salt Lake Railroad Company competed for the land cutting through Culverwell to complete a railway from Salt Lake City to Los Angeles. Lands owned by Charles Culverwell included a stretch of Meadow Valley Wash through which the proposed railway would travel (Hulse 1971). After a lengthy legal dispute about which company would occupy the wash, the two factions reconciled, and construction of the UPRR line was underway. The site of "Clover Junction" at Culverwell was named in 1901 as the point where the rail line would intersect another branch heading north to Pioche, but the town name was changed to "Calientes" and then "Caliente" in 1903 due to the discovery of hot springs on the Culverwell Ranch property (Hulse 1971; University of Nevada, Las Vegas 2009). Charles Culverwell built the Culverwell Hotel in anticipation of the railroad line, but when construction of the railroad was completed in 1905 the town soon became quiet. Population fluctuated due to the "ten-day men" who came in and out of Caliente only working a certain job for a little profit (Hulse 1971). Eventually the town became a stopping point where trains could be maintained and the crews could be switched. Hotels, saloons, and houses were built, creating jobs other than those associated with the railroad. Floods in 1907 and 1910 destroyed the rail line, but each time it was rebuilt. The town prospered until the 1940s when U.S. 93 was built and shipments could be carried by trucks rather than train (Smith 2011). In 2004, Caliente was proposed as a transfer station for nuclear waste on its way to Yucca Mountain; and in 2010 it began to do just that (LeDuff 2004).

The Caliente Youth Center

All of the buildings at the Caliente Youth Center lie at least a half-mile outside the direct APE for this undertaking - and will not be affected by any project-related activities - but its entryway is within the northern boundary of the indirect APE. The facility is positioned on an alluvial fan at the base of a steep mountain face near the confluence of Meadow Valley Wash and Clover Creek Wash, a location that remained undeveloped during Caliente's boom years of mining and railroad construction in the early twentieth century. It was originally named the Nevada Girls

Training Center, and was constructed and opened in 1962 to serve as a reformatory institution for young women (Anonymous 1970, Woods 2012). The 1970 USGS Caliente, Nevada 7.5-minute topographic quadrangle shows two large rectangular structures and six smaller, circular structures. The facility was renamed the Caliente Youth Center in 1989, possibly to reflect the expansion of the facility to house young men as well as women (State of Nevada 1991). It was around this time that additional buildings were added, including two mobile classrooms and space for an additional 60 beds (Nevada Department of Administration 1990); this change is apparent when comparing the 1970 topographic quadrangles against 2013 aerial imagery. Recent improvements to the entrance of the Caliente Youth Center include the installation of a stone entry sign (Figure 5), a steel junction box, a plastic ranch-style fence, and a grass lawn, the last two positioned within the boundaries of archaeological site 26LN6830.

Figure 5. New stone sign at entrance to Caliente Youth Center; view east.

The Caliente Hot Springs Motel and Culverwell Hotel

The Caliente Hot Springs Motel lies outside the indirect APE of the proposed undertaking. As the motel stands today, its date of construction is unknown. The 1970 USGS Caliente, Nevada 7.5-minute topographic quadrangle shows structures in the same basic arrangement as they currently exist, indicating that the motel must have been built prior to 1970. The current site of the motel, however, may have once been occupied by the Culverwell Hotel, built ca. 1900-1901. As advertised in the Caliente Express and the Lincoln County Record as early as 1903, the Culverwell Hotel highlighted its ownership and guest use of the hot springs. It remained in operation by the Culverwells at least until 1908, with Mrs. Eliza Alice Culverwell as hotel proprietor and Mr. Charles Culverwell as proprietor of the hot springs (R. L. Polk & Co. 1907-1908). Sadovich (2000) also suggests that the Caliente Hot Springs Motel is located on the former site of the Culverwell Hotel. She presents a 1922 advertisement in the Caliente Weekly News for “Caliente Hot Spring” which identifies Hiram Rice as the proprietor. Sadovich (2000) notes that the hotel in 1992 was “now remodeled and active” but does not mention what the remodeling consisted of or during what year(s) it took place.

Indeed, historic GLO record indicate that the land now occupied by the Caliente Hot Springs Motel – as well as that in the current project area – was patented by Charles Culverwell on December 1, 1898 (240 acres - T4S R67E, Section 8, E1/2 and NW1/4 of SW1/4). Plat maps for the area dating to 1872 and 1881 show a single house at a spring in Section 8, NW1/4 of SW1/4 (Figures 6 and 7); this may have been the Jackman Ranch, which was later purchased by the Culverwell brothers. If the Culverwell Hotel did formerly occupy the site of the Caliente Hot Springs Motel, there appear to be no structural remnants of it left on the ground surface. It is interesting, however, that a photograph of the UPRR roundhouse and vicinity dating sometime after 1923 (Myrick 1963:651) shows a ghostly image (due to a cloud of smoke) of what appears to be a tall, two-story Spanish-style building at the current motel site (Figure 8). This building may be the original Caliente Hot Springs Motel, constructed in the same style as the UPRR railroad station-hotel.

Railroads

Caliente’s life as a railroad town began in 1902 when the Salt Lake to Los Angeles route of the UPRR was completed between Uvada (on the Utah-Nevada border) and Caliente. Rows of company houses flanked the UPRR depot and a large roundhouse and shops at the east side of town, where a wye connected the main line with the Caliente & Pioche (C&P) Railroad. The C&P, a branch of the UPRR extending north to Panaca/Bullionville and on to Pioche, was completed in 1907.

Construction of the Salt Lake Route had been slow and hampered by multiple litigious bouts between UPRR subsidiaries (controlled by E. H. Harriman) and those of the competing San Pedro, Los Angeles and Salt Lake Railroad Company (controlled by Senator William A. Clark). Additionally, during the early 1900s much of Nevada’s population was actively engaged in mining or mining-associated activities, and railroad companies found it difficult to assemble the tremendous work force necessary to build the roads. UPRR contractors “imported” work crews of European immigrants, both skilled and unskilled, who were willing and able to perform manual labor under poor conditions and for little pay. Caliente was initially a “tent city” of Irish, Italian, Austrian, Greek, and Syrian labor camps, and even after the railroad was complete, a large labor force was required to maintain it in the wake of nearly continuous floods and storm damage. Highly disastrous floods in 1907 and 1910 damaged large segments of the new railroad and wreaked havoc on its depot and shops in Caliente. Despite the periodic flooding of Meadow Valley and Clover Creek washes, railway improvements were frequently made through the 1920s to prevent wholesale destruction. The original station house, at the corner of Front Street and North Spring Street, was eventually converted to a hospital, and in 1923 a new station-hotel was built at the end of Clover Street on the east side of the UPRR line (Myrick 1963).

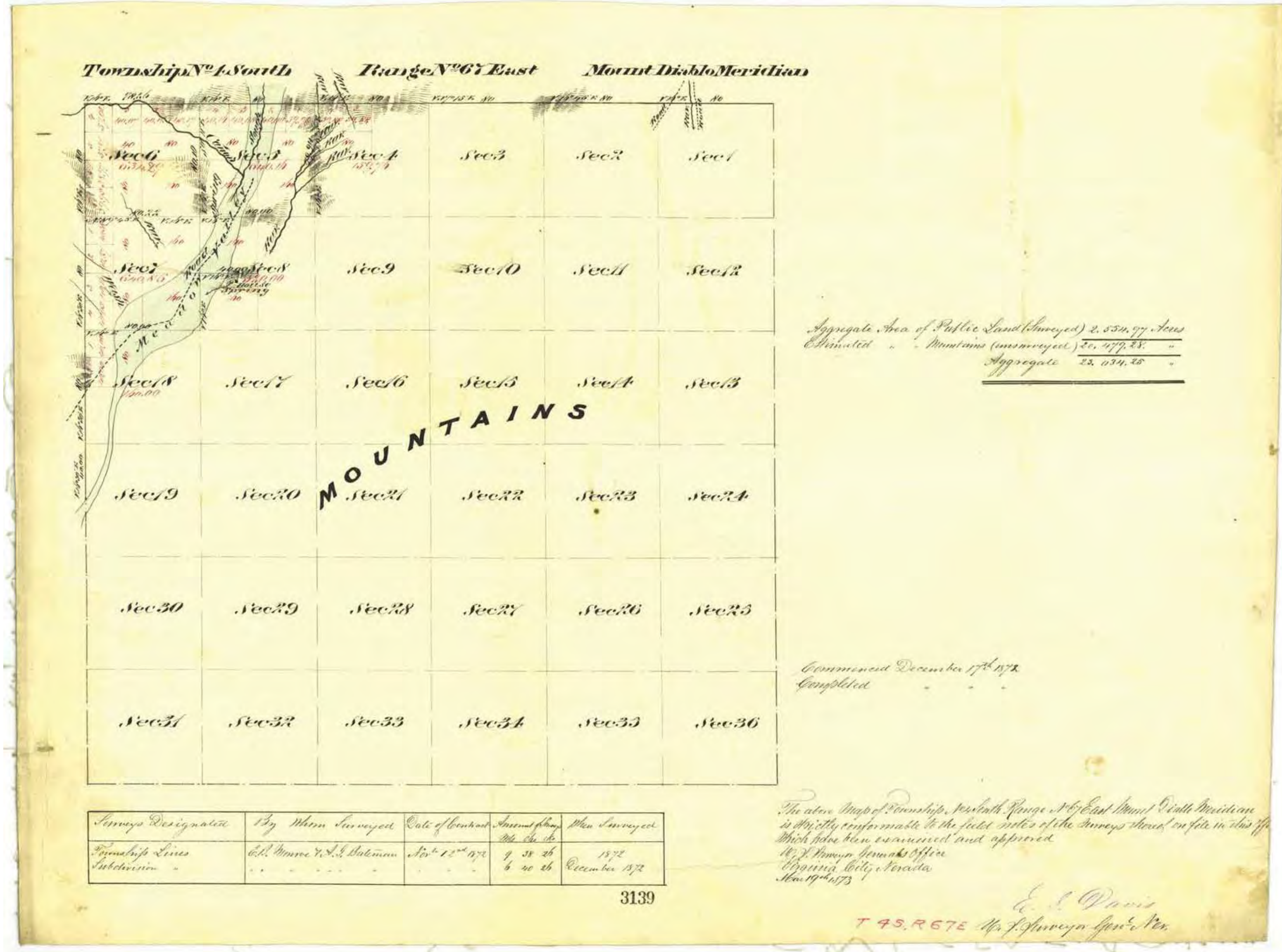

Figure 6. 1872 GLO Map for T4S R67E; house depicted in Section 8 may be the Jackman Ranch.

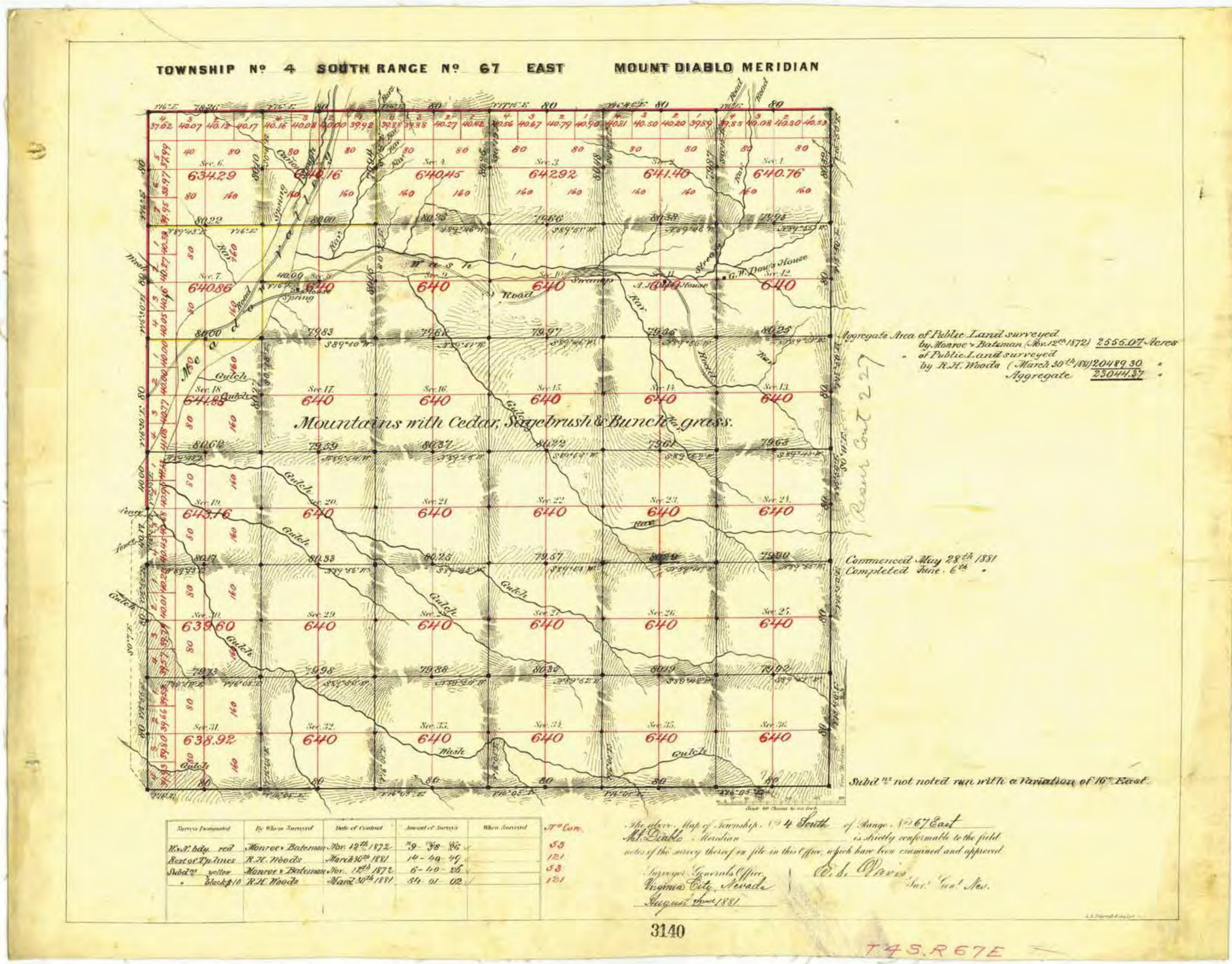

Figure 7. 1881 GLO Map for T4S R67E; house depicted in Section 8 may be the Culverwell Ranch by this time.

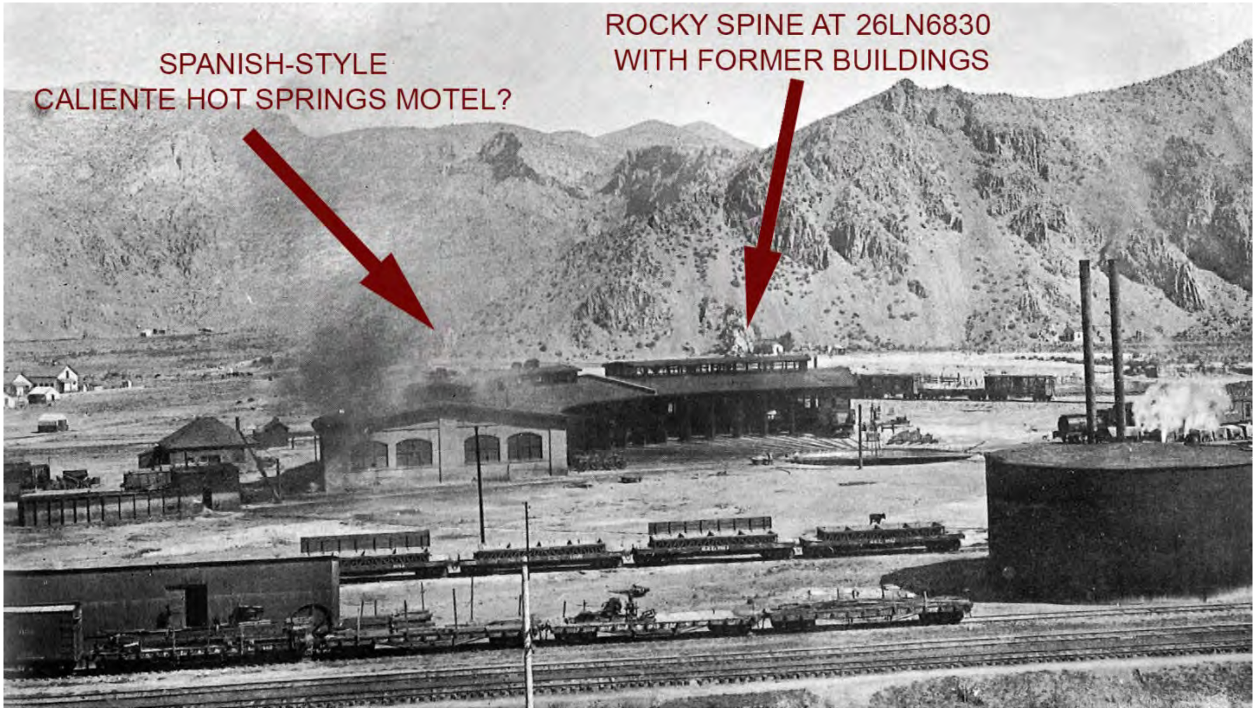

Figure 8. Historic photo of Union Pacific Railroad switchyard with current project area in background (from Myrick 1963); view southwest.

Caliente and its railroads prospered until the 1940s, when U.S. 93 was built, and truck transportation replaced rail shipping of freight, livestock and mineral ores. The mines in Pioche, which operated intermittently during the first half of the twentieth century, closed for good in the late 1950s, and the C&P route was abandoned. The roundhouse and shops had long been dismantled and removed, rails and ties were eventually pulled up, and only a few traces of the former C&P grade are currently visible. The bridge assessed in this study is the only one that still spans Clover Valley Wash. The UPRR main line, however, continues to operate through Caliente from Salt Lake City to southern California, where it intercepts the Atchison-Topeka-Santa Fe line into Los Angeles.

RECORDS SEARCH RESULTS

In-person and online records searches for this project yielded little information regarding previous cultural resources studies within a 1-mile radius. Just three inventory reports were identified, two to facilitate motorcycle races (Ferris 1988; Thomsen 1978), and one for a fiber optic cable installation project (Ferris 1990). Also, U.S. 93 is listed as an archaeological site in NVCRIS but no corresponding site record is available. Other than the route of the highway, there are no previously recorded archaeological sites within or near the APE.

3. PROJECT METHODS

Survey coverage was completed by a single surveyor walking transects 15 meters apart. Following Nevada BLM protocol, cultural resources consisting of two or more artifacts were to be classified as archaeological “sites,” while single items (or multiple fragments of one item) were classified as “isolate finds.” Many kinds of isolated features would also have been considered prehistoric sites, including any rock alignments, cleared circles, rock rings, bedrock milling features, rock hearths, and stacked rock cairns of obvious non-historic (e.g., mining) origin.

As discussed in the next chapter, one highly disturbed archaeological site containing historic refuse was identified during the survey. Its boundaries were mapped with a handheld 2010 GeoExplorer Trimble unit (sub-meter accuracy) using NAD 83 UTM coordinates. The site was given a temporary, three-part field designation beginning with “CYC” for the project name (Caliente Youth Center), “MG” for the surveyor’s initials, and a number (CYC-MG-1). No datum stakes were used, and a site centroid point was recorded for the datum.

Characteristics of the site were recorded on Intermountain Antiquities Computer System (IMACS) forms in compliance with recent Nevada BLM standards. The spatial boundaries of surface artifacts were delineated; all diagnostic artifacts were piece-plotted; and each plotted artifact was photographed front, back, and profile (if useful) with a 16-megapixel digital camera. Measurements and notes were taken for each artifact in order to describe and properly classify it during post-field analysis. Several overview photos of the site were taken in order to secure a visual record of its artifact concentrations, its built environment, and areas of disturbance.

The railroad bridge was evaluated based on a series of photographs taken during the survey fieldwork. Various hardcover and online resources were consulted to place the bridge in proper historic context. An Architectural Resource Assessment (ARA) form was prepared as part of the evaluation process (see Appendix B).

4. PROJECT RESULTS

The cultural resources inventory identified one highly disturbed archaeological site, 26LN6830, consisting of two small concentrations of historic artifacts within a broad, sparse scatter of the same materials. The railroad bridge is identified as part of the C&P railroad, built in 1911 and installed that year following a flood in 1910 that apparently destroyed the previous bridge.

26LN6830

As noted earlier in Chapter 2, the general condition of land surfaces within the APE is highly built and disturbed. While the north edge of Clover Creek Wash is in more or less natural condition, the south edge is highly disturbed. Within the APE are piles of concrete (Figure 9), asphalt, and cut perlite; concentrations of modern refuse; and heaps of cut vegetation. An unpaved road parallels the south side of the wash, and immediately south of it, just outside the east end of the APE, is an old square cement foundation underneath a large tree (Figure 10). This foundation was probably part of the stockyards at the UPRR railroad yard, which once lay directly southeast of the current APE (Figure 11).

Elsewhere in the project area, the margins of Caliente Youth Center Drive, the bed of the road entering the Caliente Hot Springs Motel, the north side of Clover Creek Wash at the entrance to the Caliente Youth Center, and the edge of the creek terrace in front of the railroad bridge are all composed of various fill material. Also composed of fill is the pad constructed for the substation, positioned immediately south of Clover Creek Wash along the east side of Caliente Youth Center Drive and the unpaved road that runs along the south side of the wash. An undated photo of Clover Creek Wash presented by Myrick (1963:650) shows the location of the C&P bridge and the electrical substation that are just outside the south side of the APE (Figure 12). It is also notable that another undated photo from Myrick (1963:651), presented earlier in this report (see Chapter 2, Figure 8), shows the presence of some type of house and other structures on the valley floor immediately in front of the short, rocky spine that is now present at the entrance to the Caliente Youth Center. The 1970 USGS Caliente, Nevada 7.5-minute topographic quadrangle also shows the presence of a building at this location (Figure 13), but there are currently no traces of any structures once present at the current entrance to the Caliente Youth Center.

The entryway to the Caliente Youth Center also appears to be recently graded. Paralleling the west side of the road, north of the wash, and all along the west side of the grassy area into the Youth Center property, is a tall (3-ft.), loose berm composed of multiple piles of fill (Figures 14 and 15). The berm is more than 300 ft. long and extends well beyond the north end of the APE on to the grounds of the Youth Center. According to staff at the Caliente Youth Center, this berm is composed of alluvial material that is regularly excavated from Clover Creek Wash in an effort to prevent seasonal flooding of the entry road (Jamie Killian [Caliente Youth Center Superintendent], personal communication 2013). The volume of fill in this berm contains a wide variety of historic refuse and represents one of the two main concentrations of artifacts at 26LN6830 (see below). A plastic ranch-style fence has also been recently installed along the road within the entryway, extending southward from the property into the north end of the site (see Figure 15).

Figure 9. Concrete and perlite rubble at south edge of Clover Creek Wash; view northwest.

Figure 10. Concrete railroad stockyard foundation outside APE; view southwest.

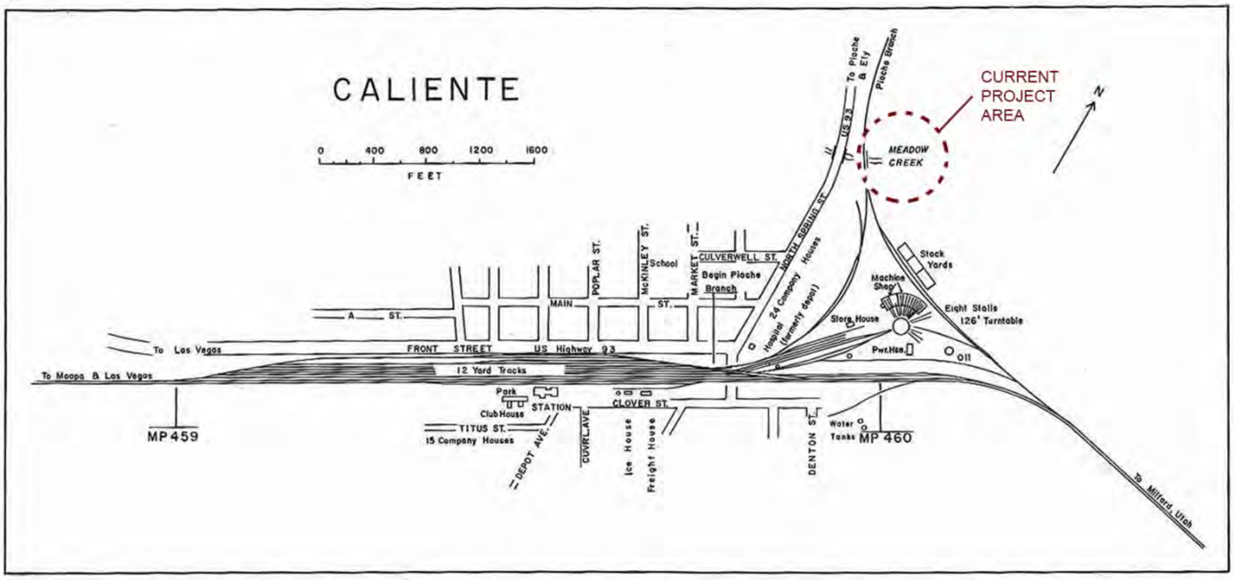

Figure 11. Map of Union Pacific Railroad switchyard and facilities (from Myrick 1963).

Figure 12. Historic photo of Caliente with portion of current project area in foreground (from Myrick 1963); view southwest. Note location of C&P bridge.

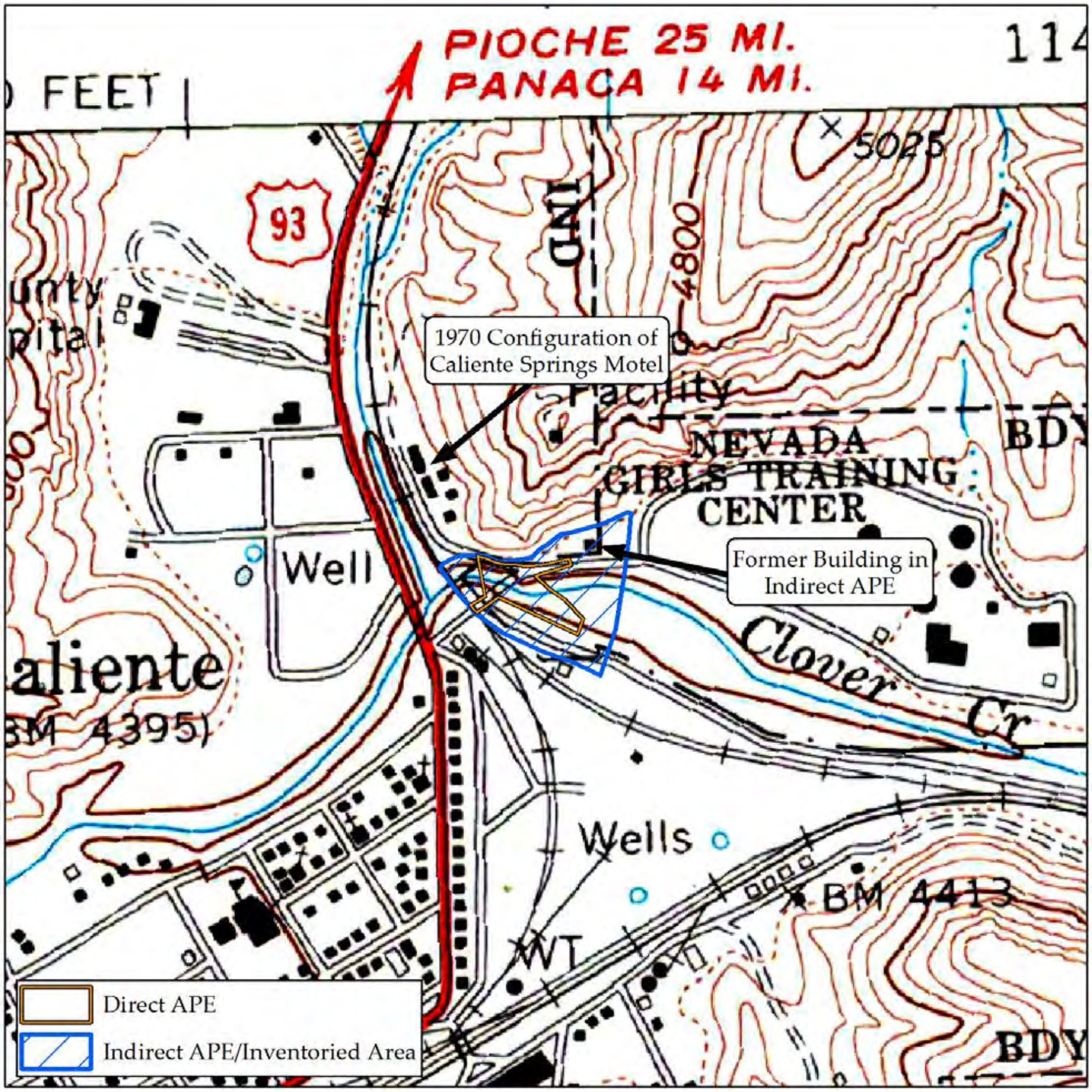

Figure 13. Project location on 1970 USGS Caliente, Nevada 7.5-minute topographic quadrangle.

Figure 14. Fill-constructed berm at north end of 26LN6830, Concentration 1; view southwest.

Figure 15. Extension of berm outside APE, site 26LN6830, Concentration 1; view northeast.

Spread across this disturbed landscape is site 26LN6830, representing a mix of historic refuse within fill deposits that are divided by Clover Creek Wash, Caliente Youth Center Drive, and the entry road to the Caliente Hot Springs Motel (Figures 16 and 17 show direct/indirect APEs and inventory area; see Appendix A for confidential site map). In all, the site contains perhaps 700-1,000 artifacts visible on the surface, most of which are small, highly fragmented pieces of bottle glass. Other surface artifacts include shards of window glass, sherds of earthenware ceramic and porcelain from dishware and teacups, pieces of unidentified metal, pieces of ceramic sewer pipe, an automobile drive shaft, strands of heavy gauge fencing wire, sections of metal pipe, jumper cable terminals, pieces of milled wood, chunks of concrete, fragments of sanitary cans, bits of ceramic insulator, small hardware (e.g., nails, screws, washers), and pieces of cut cow bone.

Two relatively dense accumulations of debris are present at 26LN6830 (see Appendix A), one within the berm at the entryway to the Caliente Youth Center (Concentration 1), and the other in the foundation pad for the electrical substation south of the wash (Concentration 2). Most of the larger artifacts, like the automobile drive shaft, and many of the intact bottle bases with diagnostic maker's marks, occur in Concentration 1. Some materials at this location are clearly buried in fill excavated from Clover Creek Wash, while others appear to have been discarded recently and lie in a narrow depression between the berm and the base of the adjacent hillslope. Materials in Concentration 2 are more highly fragmented, consisting mainly of bottle glass shards, ceramic sherds, and bits of small hardware. These materials clearly occur within fill matrix imported to construct the substation pad. Artifacts are found in lower densities elsewhere at the site, such as at the entrance to the Caliente Hot Springs Motel and on the terrace fronting the railroad bridge. Some diagnostic items even appear intentionally set in conspicuous places (e.g., Artifacts 5-7, below), perhaps by children playing in or around the wash.

Nine diagnostic and semi-diagnostic artifacts were identified and recorded at 26LN6830, four in Concentration 1 (Artifacts 1-4), three on rip-rap boulders at the entrance to the Caliente Hot Springs Motel (Artifacts 5-7), and two in Concentration 2 (Artifacts 8 and 9).

Glass Artifacts

Artifact 1 is an amethyst (possibly canning) jar base embossed with "PARAGON PATENTED" (Figure 18) This mark is not specific to any particular time frame, but amethyst glass is a by-product of manufacturing methods in use between ca. 1880 and 1917 (Jones and Sullivan 1989). Artifact 2 is an amethyst double ring-tooled bottle finish. Tooled finish manufacturing was in use from the 1870s to 1920s (Rock 1990); this time frame is consistent with the production date range for amethyst glass. Artifact 3 is an oval, colorless bottle base embossed with "(FU)LL PINT." The base also has a distinct Owen's machine suction scar, which dates between 1904 and 1969 but was commonly seen on bottles manufactured in the United States from 1904 until the 1920s (Miller and Sullivan 1984; Toulouse 1969). Artifact 4 is a colorless brandy finish, either tooled finish or automatic bottle machine (Figure 19). It likely dates to the 1940s or earlier.

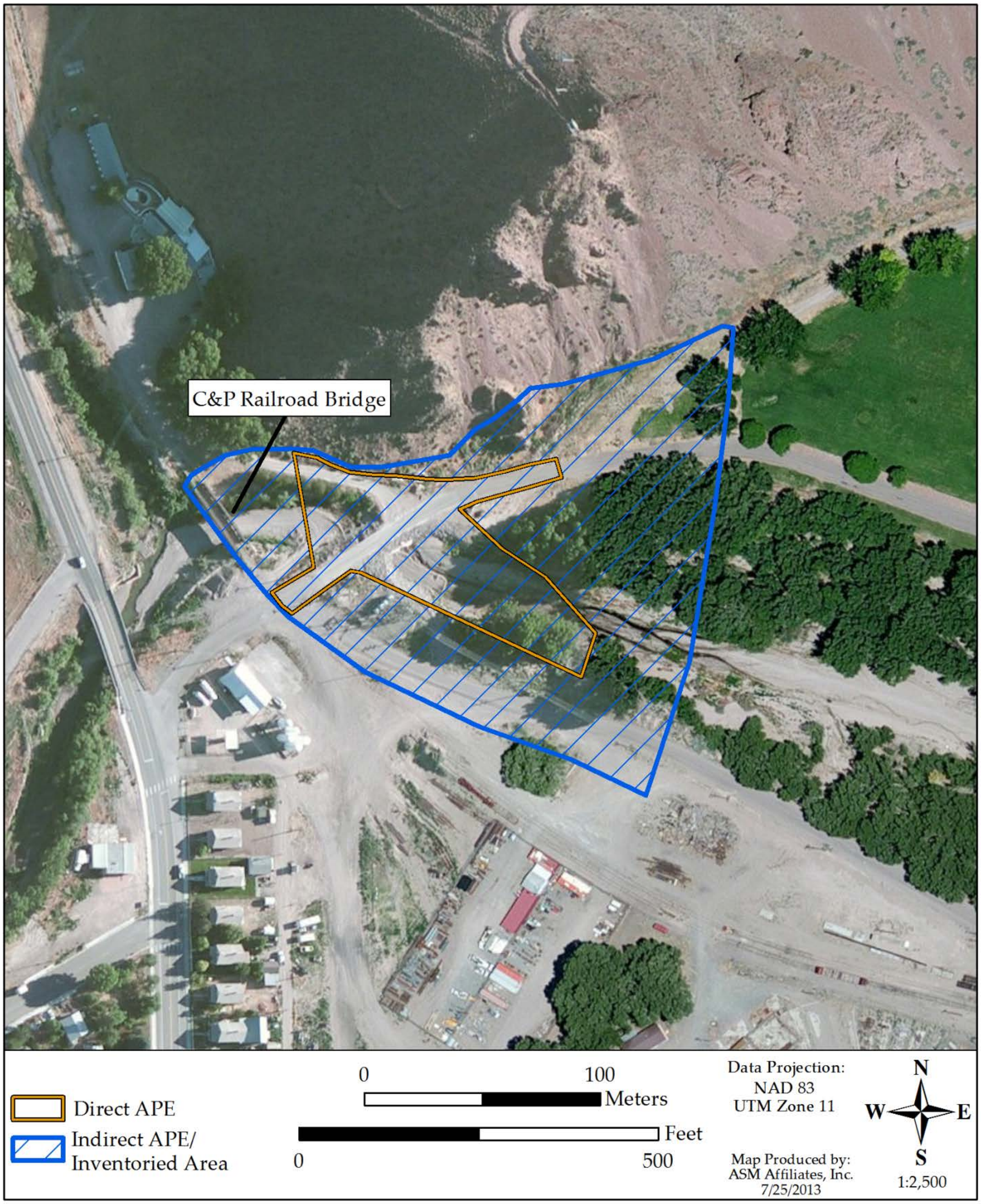

Figure 16. Aerial map of project area, including Direct and Indirect APEs and C&P Railroad bridge.

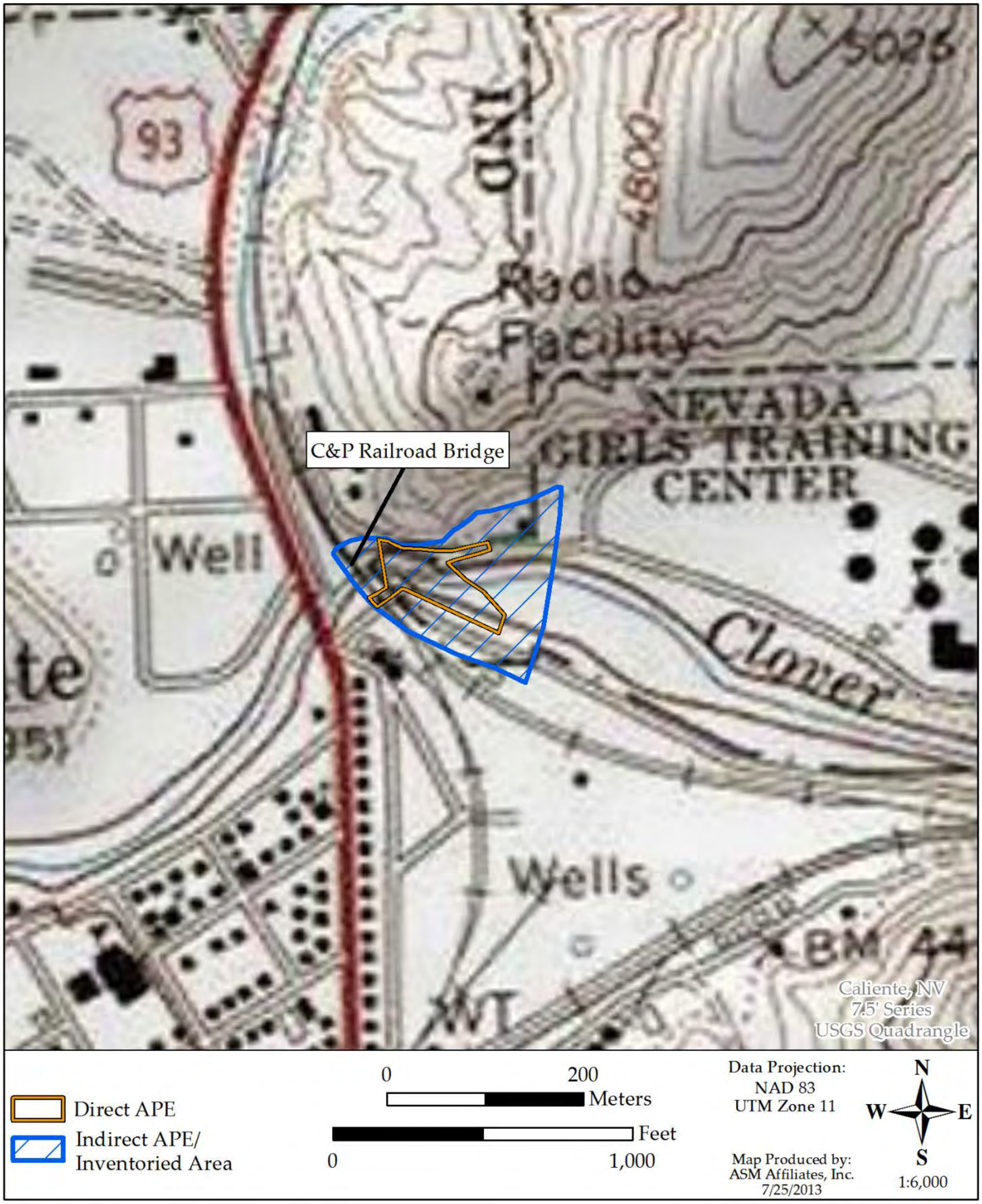

Figure 17. Topographic map of project area, including Direct and Indirect APEs and C&P Railroad bridge.

Figure 18. Artifact 1, amethyst bottle base with “PARAGON” mark.

Figure 19. Artifact 4, profile of colorless brandy-style bottle finish.

All of these artifacts were found in the berm at Concentration 2 amongst a variety of bottle/jar glass shards (amethyst, brown, colorless, aqua, green, and cobalt) and with a wide range of other artifacts. Most of the bottles represented appear to be liquor or soda bottles, and no obvious pharmaceutical bottles were identified. Fragments of window glass are quite thin and colorless, probably deriving from single-pane windows.

Ceramic Artifacts

Artifact 5 is a base sherd of a white improved earthenware plate (Figure 20). It bears a black transferprint maker's mark reading "…NA / (Royal Coat of Arms) / …AKIN / …EY / …AND." This mark is likely the same one used by J. & G. Meakin in Hanley, England ca. 1890 + (Kovel and Kovel 1986:11). Artifact 6 is another base sherd of a white improved earthenware plate, with a black transferprint maker's mark reading "D.E. McNICOL (underlined) / CLARKSBURG, W.VA" (Figure 21). This mark was in use by the D. E. McNicol Pottery Company from 1915 to 1929 (Kovel and Kovel 1986:170). Artifact 7 is another base sherd of a white improved earthenware (possibly ironstone) plate. This one has a blue underglaze transferprint "Willow" pattern on the surface (Figure 22), and a maker's mark on the bottom in blue transferprint with a sphinx above "Petrus / Regout / MAASTRICH(T) / (WI)LL(OW)" (Figure 23) The Petrus Regout company in Holland was in business from 1836 to ca. 1931 (Kovel and Kovel 1986:127), and this specific maker's mark appears to have been used from 1879 to 1899 (Geheugen van Nederland 2013). Artifact 8 is a porcelain teacup rim with gilded and multicolor floral decal designs on exterior surface, and Artifact 9 is a porcelain bowl rim with a black transferprint design on interior. Neither of these last two items is diagnostic, but they appear to represent late nineteenth-century products.

Many other sherds of white improved earthenware and porcelain are also present at 26LN6830, and all those identified appear to derive from dishware or teacups. No pieces of heavy plates, thick coffee mugs, or other dishware typical of twentieth-century production were observed. Other ceramic artifacts include sections of sewer pipe and pieces of brown glazed ceramic telegraph insulators. These are most likely late-early twentieth-century artifacts (e.g., 1930s-1940s), judging by their condition.

Other Artifacts

Though not plotted or photographed, many other kinds of artifacts are present at 26LN6830 within Concentration 1. An automobile drive shaft, terminals for jumper cables, sections of heavy gauge wire, pieces of plastic and rubber, and other such materials are clearly of modern origin and were probably discarded fairly recently. Chunks of concrete, pieces of metal pipe, bits of cut animal bone, and other items may be of historic age and are likely associated with the berm fill.

Summary and Discussion

Historic artifacts at 26LN6830 appear to date between 1890 and the 1960s, while modern items could be anywhere from 10 to 50 years of age. Most historic glass and ceramic artifacts represent things normally found in domestic refuse deposits (e.g., liquor bottles, beverage bottles, dishware), while many other items also reflect structural or domestic functions/activities associated with households (e.g., small hardware, cut cow bone, sewer pipe, window glass).

Figure 20. Artifact 5, view of earthenware plate base with J & G Meakin mark.

Figure 21. Artifact 6, view of earthenware plate base with D. E. McNicol mark.

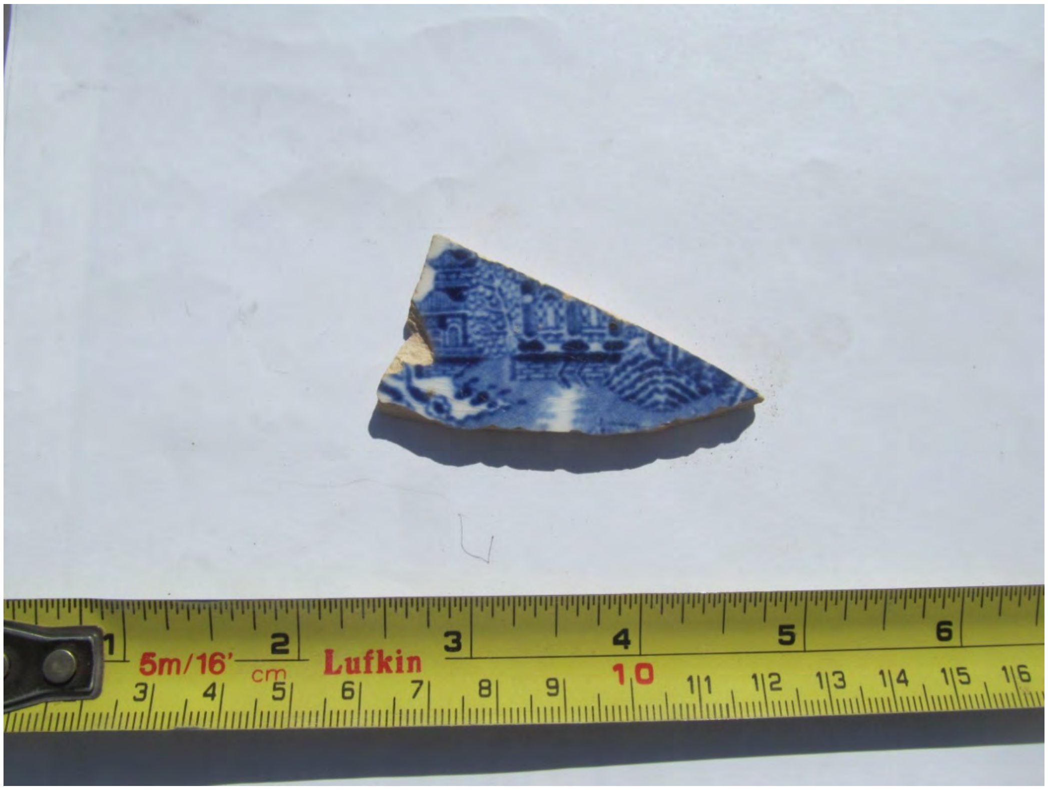

Figure 22. Artifact 7, view of earthenware plate interior with Willow pattern.

Figure 23. Artifact 7, view of earthenware plate base with Petrus/Regout mark.

Pieces of larger structural debris (e.g., concrete chunks, pipe) could also derive from households as a result of intended demolition projects or structural failure.

Considering the overall condition of the site, the kinds of artifacts it contains and their locations, and the testimony of the Caliente Youth Center staff, it can only be concluded that 26LN6830 represented a highly disturbed, mixed accumulation of historic and modern artifacts associated with fill material excavated from Clover Creek Wash. Concentrations of artifacts probably derive from multiple episodes of excavation in the wash, most items ultimately originating from deposits of domestic refuse located somewhere to the east and upstream alongside the drainage. Historic artifacts at 26LN6830 are thus in tertiary depositional context, having been removed (presumably by flood events) from primary refuse accumulations, re-deposited within the bed of Clover Creek Wash, and excavated from the wash with mechanical equipment and either piled up into a long berm (Concentration 1) or used as fill material for construction (Concentration 2). In this sense, 26LN6830 is not really an archaeological "site" in the strictest meaning (i.e., a place having direct evidence of human activity) but is merely an unintended accumulation of artifacts resulting from a combination of natural processes (flooding) and human activity (wash excavation). Added to this is the intentional discard of modern refuse at Concentration 1, including materials that date anywhere from the 1960s to the present.

CALIENTE & PIOCHE RAILROAD BRIDGE

Situated just beyond the southwest edge of the APE is an old, abandoned railroad bridge crossing Clover Creek Wash (Figures 24 and 25). It was formerly a feature of the C&P Railroad, a branch of the UPRR's Salt Lake Route. At present there are no tracks running to or over the bridge and the structure is used for pedestrian traffic only. The bridge has been spraypainted silver and is evidently repainted on a regular basis to erase tagging/graffiti. Its deck ties show footwear from pedestrian use but the steel section of the bridge is otherwise unworn and undamaged. Its wooden substructure, however, appears to be slowly deteriorating and is in need of repair.

The C&P bridge is a common pony (thru-truss) plate-girder steel bridge supported by an abutment of vertical wooden pilings capped with a stacked beam-and-tie platform (Figure 26). The steel girders flanking the bridge are attached to the deck with knee braces. The deck itself consists of wooden railroad ties bolted directly to the substructure, which is composed of approximately 10 floor beams that span the width of the bridge. The floor beams are connected by steel I-beam stringers and secured by narrow cross-beams along the bottom of the substructure (Figure 27). The steel bridge is approximately 60 ft. long and 8 ft. wide with 4-ft. high girders. Both ends of the bridge are connected to short approach decks composed entirely of stacked beams and large wooden beam stringers with attached railroad ties (Figure 28). The supports under this approach (Figure 29) appear temporary and may have been installed for bridge access after the flood of 1938 (see below) or when the rails were taken up ca. 1965. Other than the wooden ties remaining on the bridge deck, all others were removed along with the rails.

Figure 24. East end of C&P bridge, view northwest.

Figure 25. Full length of C&P bridge, view southwest.

Figure 26. West end of C&P bridge, view southeast.

Figure 27. Underside of C&P bridge showing I-beam construction.

Figure 28. Profile of C&P bridge west approach deck, view southwest.

Figure 29. Substructure of west end C&P bridge, view southeast.

Figure 30. Plaque of American Bridge Company, 1911.

A girder plate at one end of the bridge features a bolted-on steel plaque indicating the bridge was manufactured by the American Bridge Company of New York, U.S., 1911 (Figure 30, above). The American Bridge Company (ABC) was the largest and most widely used manufacturer of pre-fabricated steel bridges during much of the twentieth century and is still in business (as American Bridge). ABC was formally incorporated in New Jersey in 1900 by J. P. Morgan and Company (American Bridge Company 2013; Deseret News 1902). It was an independent company for less than a year, when most of its stock was acquired by United States Steel Corporation, of which it became a subsidiary. That first year ABC also purchased 24 other bridge companies, representing most of its competitors and amounting to nearly 50 percent of the nation's steel bridge fabricating capacity. One of these new subsidiaries, the American Bridge Company of New York, was responsible for all ABC sales, contracts, and erection from January 1901 to December 1913. ABC bridges of various designs for railroad or highway use were manufactured and partially pre-assembled at the factory, then packaged and shipped to the bridge site where installation was completed. Pony truss bridges were typically used on railroad grades because their shallow construction depth required little change in the height of the grade. Given that a devastating flood damaged much of the C&P track and Caliente facilities in 1910, the installation of a new bridge over the Clover Valley Wash in 1911 is logical and implies that the bridge is original to its location.

Figure 31. Historic photo of C&P bridge, washed out by 1938 flood (from Myrick 1963).

In fact, two photographs presented by Myrick (1963:650, 670) are relevant to the evaluation of the bridge and its location. The first (see Figure 12) provides a viewshot southeast into Caliente that includes a portion of the current project area. This photo shows the bridge in its original and present location (bottom right edge of the image), complete with tracks leading into the former switchyard of the UPRR; although undated, the photo must have been taken sometime prior to 1960. The railway looks to be defunct by this time, judging by the amount of dirt covering the railroad tracks along an unimproved road that is now Caliente Youth Center Drive. The bridge also has no associated facilities or mechanisms and appears to rest on a wooden substructure (like the present one), unlike the concrete substructure supporting it in an earlier photo (Figure 31, above) that depicts the aftermath of a flood in 1938. These images demonstrate that, while the bridge likely remains in its original 1911 location, it rests on a wooden substructure that replaced an original concrete foundation sometime after 1938. As shown in Figure 12 and Figure 31, various external mechanisms that were part of the bridge prior to 1938 (e.g., single posts, overhead wires) had been removed by ca. 1960.

5. NRHP EVALUATIONS AND MANAGEMENT RECOMMENDATIONS

Having provided an appropriate historic context and described the cultural resources examined during this study, it remains to evaluate sites 26LN6830 and the P&C Railroad bridge with respect to their eligibility for listing in the NRHP and to provide basic recommendations for managing these two resources throughout the remainder of the flood mitigation project.

26LN6830

This site is a highly disturbed, mixed deposit of historic and modern refuse spread across both sides of Clover Creek Wash. It occurs within an essentially built environment that has seen years of road construction, grading, and probably regular flood control work. The site contains two zones of dense artifacts, one present within a constructed berm (Concentration 1) and the other within a constructed substation pad (Concentration 2). Fill deposits in both of these locations likely derive from material excavated from Clover Creek Wash following flood events. Historic materials are thus in displaced contexts, having washed down from refuse accumulations somewhere upstream and ending up in excavated fill. All identified surface artifacts are highly fragmented and diagnostic items appear few. Those that are time-sensitive reflect a broad time frame (ca. 1890-1960s), with many functions and traits that are indicative of mixed deposits. All in all, site 26LN6830 appears to have extremely poor physical integrity with cultural materials in tertiary depositional context.

Given the unknown sources of its artifacts and the poor context in which they occur, site 26LN6830 appears to have very low data potential with regard to any aspect of the historic past in Meadow Valley or the town of Caliente. With respect to NRHP evaluation criteria, the site cannot be associated with historic events (Criterion A) or persons important in history (Criterion B). It does not embody the distinctive characteristics of a type, period, or method of construction, does not reflect the work of a master architect or engineer, and does not represent a significant and distinguishable entity whose components may lack individual distinction (NRHP Criterion C). The site also lacks the ability to contribute important information about the past, as it cannot provide useful data regarding local chronology, settlement, transportation or any other aspect of local or regional history (Criterion D). As such, site 26LN6830 is recommended not eligible for NRHP listing under any evaluation criteria.

C&P RAILROAD BRIDGE

In terms of its architectural traits, the C&P Railroad bridge has been modified considerably since its original construction. Many of its original components are gone, including its deck and tracks; it currently rests on a temporary wooden substructure that replaced its original concrete foundation sometime after 1938; and it has been painted and repainted silver on numerous occasions. Given its current condition, and the fact that it is of very common type, the bridge does not embody the distinctive characteristics of a type, period, or method of construction and does not represent the work of a master architect or engineer.

Because the C&P Railroad bridge lies outside the overall APE for the proposed undertaking, it will suffer no adverse effect as a result of any project-related activities. The bridge is thus left as unevaluated for NRHP listing, although it is unlikely to be found eligible under any NRHP criteria in the course of any formal evaluation.

MANAGEMENT RECOMMENDATIONS

Upon SHPO review, should site 26LN6830 be deemed not eligible for NRHP listing it will be unnecessary to avoid the site during earth-moving activities associated with the Caliente Youth Center Bridge Flood Mitigation Project. In fact, the majority of Concentration 1 at 26LN6830 actually lies outside the direct APE and is not at direct risk to damage. It is highly unlikely that any intact, buried cultural deposits associated with 26LN6830 will be unearthed during project-related activities.

With respect to the C&P Railroad bridge, this structure lies outside the direct and indirect APEs and will not be affected by project-related construction. Although it has insignificant architectural characteristics, the bridge does appear to retain some interpretive value for local history. It is a common type of steel bridge but may be one of only a few left intact from the C&P Railroad. Thus, it may be worthwhile sometime in the future – even if it is found not eligible for NRHP listing during a formal evaluation - to restore the bridge and move it to a local park, railroad museum, or other place where its simple aesthetic can be appreciated by the public.

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APPENDICES

APPENDIX A

IMACS Site Form

IMACS SITE FORM

Part A – Administrative Data

INTERMOUNTAIN ANTIQUITIES COMPUTER SYSTEM
Form approved for use by
BLM - Utah, Idaho, Wyoming, Nevada
Division of State History - Utah, Wyoming
USFS - Intermountain Region
NPS - Utah, Wyoming

1. State No.: 26LN6830
2. Agency No.:
3. Temp No.: CYC-MG-1

4. State: Nevada **County:** Lincoln

5. Project: 07-S04 - Caliente Youth Center Bridge Flood Mitigation

6. Report No.: None

7. Site Name:

8. Class: [ ] Prehistoric [X] Historic [ ] Paleontological [ ] Ethnographic

9. Site Type: Refuse Deposit

10. Elevation (ft): 4,350 feet

11. UTM Grid: Zone 11 719867 **mE** 4166593 **mN** **(NAD 83 Centroid)**

12. NE **1/4 of** NW **1/4 of** **Section** 8 **T 4S** **R 67E**

13. Meridian: Mt. Diablo (7)

14. Map Reference: USGS 1970 Caliente, Nevada 7.5-minute quadrangle

15. Aerial Photo:

16. Location and Access: The site is located on both sides of Clover Creek Wash alongside Caliente Youth Center Drive in Caliente, Nevada. Traveling north on U.S. 93 through Caliente, turn right on Caliente Youth Center Drive and travel approximately 0.1 miles across Clover Creek Wash. Park near the entrance sign to the Caliente Youth Center; the main artifact concentration is in the excavated berm immediately west of the road.

17. Land Owner: State of Nevada

18. Federal Admin. Units; **Forest:** **District:**

19. Location of Curated Materials: None

20. Site Description: This is a highly disturbed, widespread deposit of historic and modern refuse located at the intersection of Clover Creek Wash and Caliente Youth Center Drive. Cultural materials are mainly present in two areas, within and surrounding a long berm on the west side of Caliente Youth Center Drive that is composed of fill removed from Clover Creek after flood events (Concentration 1) and within fill used to construct the pad for an electrical subtation, south of Clover Creek on the east side of Caliente Youth Center Drive (Concentration 2). Historic artifacts consist mainly of bottle glass shards, earthenware ceramic sherds, and porcelain sherds, but include pieces of unidentified metal, pieces of ceramic sewer pipe, milled wood, chunks of concrete, fragments of sanitary cans, bits of ceramic insulator, and pieces of cut faunal bone. Modern debris includes an automobile drive shaft, wire, metal pipe, jumper cable terminals, pieces of plastic and rubber, etc.

21. Site Condition: [ ] Excellent [ ] Good [ ] Fair [X] Poor

22. Impact Agent(s): Flooding, grading and bulldozing, roads, fences, facilities

23. National Register Status: [ ] Significant (C) [X] Non-Significant (D) [ ] Unevaluated (Z)

Justify: This site is highly disturbed, containing artifact within deposits of fill regularly excavated from Clover Creek during flood events and in the fill of an earthen pad for an electric transformer station. All of the historic materials are in displaced, tertiary depositional context, having washed down from refuse accumulations somewhere upstream and ending up in fill material excavated from Clover Creek Wash. Dateable items thus reflect a broad time frame (ca. 1890-1960s) and the overall assemblage represents a wide variety of functions, though most artifacts consist of household or domestic refuse. Given the unknown sources of its artifacts, and the poor depositional contexts in which they occur, site 26LN6830 appears to have no potential to yield useful data regarding the historic past in Meadow Valley or the town of Caliente.

24. Photos: See attached Photo Page

25. Recorded by: Mark A. Giambastiani

26. Survey Organization: ASM Affiliates, Inc.

27. Assisting Crew Members: None

28. Survey Date: May 25, 2013

List of Attachments:

[ ] Part B	[X] Topo Map	[X] Photos	[ ] Continuation Sheets
[X] Part C	[X] Site Sketch	[ ] Artifact/Feature Sketch	[ ] Other:________________
[ ] Part E			

Part A – Environmental Data

State No.: 26LN6830
Agency No.:
Temp No.: CYC-MG-1

29. Slope: 0 degrees **Aspect:** 0 degrees

30. Distance to Permanent Water: 3 **X 100 Meters**

Type of Water Source: [X] Spring/Seep (A) [X] Stream/river (B) [ ] Lake (C) [ ] Other (D)

Name of Water Source: Hot springs at Caliente Hot Springs Motel ~300 m west; Clover Creek Wash runs through site

31. Geographic Unit: Meadow Valley

32. Topographic Location (Check one under each heading):

Primary Landform:

[ ] mountain spine (A)	[ ] tableland/mesa (C)	[X] valley (E)	[ ] canyon (G)
[ ] hill (B)	[ ] ridge (D)	[ ] plain (F)	[ ] island (H)

Secondary Landform:

[ ] alluvial fan (A)	[ ] ledge (K)	[ ] spring mound/bog (V)
[ ] alcove/rock shelter (B)	[ ] mesa/butte (L)	[ ] valley (W)
[ ] arroyo (C)	[ ] playa (M)	[ ] cutbank (X)
[ ] basin (D)	[ ] port. geo. feature (N)	[ ] riser (Y)
[ ] cave (E)	[ ] plain (O)	[ ] Multiple S.L. (1)
[ ] cliff (F)	[ ] ridge/knoll (P)	[ ] Bar (2)
[ ] delta (G)	[ ] slope (Q)	[ ] Lagoon (3)
[ ] detached monolith (H)	[X] terrace/bench (R)	[ ] EphemeralWash (4)
[ ] dune (I)	[ ] island (T)	[ ] Kipuka (5)
[ ] floodplain (J)	[ ] outcrop (U)	[ ] Saddle/Pass (6)

Describe: Artifacts at 26LN6830 lie within fill matrix in tertiary depositional contexts alongside Clover Creek Wash. Creekside terraces have been significantly altered during historic and modern times and have few natural characteristics remaining.

33. On-Site Depositional Context:

[ ] fan (A)	[ ] extant lake (G)	[ ] landslide (M)	[ ] none (T)
[ ] talus (B)	[ ] alluvial plain (H)	[ ] delta (N)	[ ] residual (U)
[ ] dune (C)	[ ] colluvium (I)	[ ] desert pavement (P)	
[X] stream/terrace (D)	[ ] moraine (J)	[ ] outcrop (Q)	
[ ] playa (E)	[ ] flood plain (K)	[ ] stream bed (R)	
[ ] extinct lake (F)	[ ] marsh (L)	[ ] aeolian (S)	

Description of Soil: Mixed alluvial fill composed of rock, gravel, and sand

Part A – Environmental Data

State No.: 26LN6830
Agency No.:
Temp No.: CYC-MG-1

34. Vegetation:

a. Life Zone:

[ ] Arctic-Alpine (A)	[ ] Hudsonian (B)	[ ] Canadian (C)
[ ] Transitional (D)	[X] Upper Sonoran (E)	[ ] Lower Sonoran (F)

b. Community:

[Q] Primary On-Site	[L] Secondary On-Site	[Q] Surrounding Site

Aspen (A)	Wet Meadow (I)	Low Sagebrush (Q)
Spruce-Fir (B)	Dry Meadow (J)	Barren (R)
Douglas-fir (C)	Oak-Maple Shrub (K)	Marsh/Swamp (S)
Alpine Tundra (D)	Riparian (L)	Lake/Reservoir (T)
Ponderosa Pine (E)	Grassland/Steppe (M)	Agricultural (U)
Lodgepole Pine (F)	Desert Lake Shore (N)	Blackbrush (V)
Other/Mixed Conifer (G)	Shadscale Community (O)	Creosote Bush (Y)
Pinyon-Juniper Woodland (H)	Tall Sagebrush (P)	

Describe: Site lies adjacent to Clover Creek Wash which supports a broad zone of riparian vegetation within its drainage and along its banks. Areas where artifacts occur are modified and devoid of vegetation, but occur within a low sagebrush community. Unmodified landscapes beyond the site and creek are also within a low sagebrush community.

35. Miscellaneous Text (25 character limit):

36. Comments/Continuations:

PART C - HISTORIC SITES

State No.: 26LN6830
Agency No.:
Temp No.: CYC-MG-1

1. Site Type: Refuse Deposit

2. Historic Theme(s): Transportation

3. Culture:

Affiliation	Dating Method	Affiliation	Dating Method

Describe:

4. Oldest Date: ~1879 **Recent Date: ~1929**

How Determined? Ceramic maker's marks and other time-sensitive production attributes

5. Site Dimensions: ft X ft Area: sq. ft

6. Surface Collection/Method:

[X] None (A) [ ] Designed Sample (C)
[ ] Grab Sample (B) [ ] Complete Collection (D)

Sampling Method:

7. Estimated depth of fill:

[ ] Surface (A) [ ] 0-20 cm (B) [ ] 20-100 cm (C) [ ] 100 cm+ (D)
[X] Fill noted but unknown (E) [ ] Depth suspected but untested (F)

How Estimated (If tested, show location on site map.): Artifacts occur in piles of fill that are 3-4 feet high

8. Excavation Status:

[ ] Excavated (A) [ ] Tested (B) [X] Unexcavated (C)

Testing Method:

9. Summary of Artifacts and Debris: (Refer to Guide for others)

[X] Glass (GL) [X] Bone (BO) [ ] Leather (LE) [ ] Ammunition (AM)
[X] Ceramics (CS) [X] Wire (WI) [X] Wood (WD) [X] Metal (ME)
[ ] Nails (NC,NW) [ ] Fabric (FA) [X] Tin Cans [ ] Rubber (RB)

Describe:

The site contains an estimated 700-1,000 fragments and portions of glass bottles, many of those on the surface being small body shards. Some window glass is also present on the surface but in very limited quantity. Other artifacts include sherds of earthenware ceramic and porcelain from dishware and teacups, pieces of unidentified metal, sherds of ceramic sewer pipe, an automobile drive shaft, strands of wire, sections of metal pipe, jumper cable terminals, pieces of milled wood, chunks of concrete, fragments of sanitary cans, bits of ceramic insulator, and pieces of cut faunal bone.

10. Ceramic Artifacts:

Paste	Glaze/Slip	Decoration	Pattern	Vessel Form(s)	#

PART C - HISTORIC SITES

State No.: 26LN6830
Agency No.:
Temp No.: CYC-MG-1

a. Estimated Number of Ceramic Trademarks:

Describe:

Artifact 5 – A white improved earthenware plate base with a black transferprint maker's mark reading "…NA / (Royal Coat of Arms) / …AKIN / …EY / …AND." This mark is likely the same one used by J. & G. Meakin in Hanley, England ca. 1890 + (Kovel and Kovel 1986:11)

Artifact 6 – A white improved earthenware plate base with a black transferprint maker's mark on the base reading "D.E. McNICOL (underlined) / CLARKSBURG, W.VA." This mark was in use by the D.E. McNicol Pottery Company from 1915 to 1929 (Kovel and Kovel 1986:170).

Artifact 7 – A white improved earthenware plate (possibly ironstone) fragment with a blue underglaze transferprint Willow pattern on the surface. The maker's mark on the base is also a blue transferprint with a sphinx above "Petrus / Regout / MAASTRICH(T) / (WI)LL(OW)." The Petrus Regout company in Holland was in business from 1836 – 1931 + (Kovel and Kovel 1986:127). This specific maker's mark appears to have been used from 1879 – 1899 (Geheugen van Nederland 2013).

Artifact 8 – A porcelain teacup rim with gilded and multicolor floral decal designs on exterior surface.

Artifact 9 – A porcelain bowl rim with black transferprint design on interior.

11. Glass:

#	Manufacture	Color	Function	Trademarks	Decoration
		Amethyst		See Artifact 1	-
		Brown			-
		Colorless		See Artifact 3	-
		Aqua			-
		Green			-
		Cobalt			-

Describe:

Artifact 1 – An amethyst (possibly canning) jar base embossed with "PARAGON PATENTED." Amethyst glass is a by-product of manufacturing methods in use between 1880 – c.1917 (Jones and Sullivan 1989).

Artifact 2 – An amethyst double ring tooled bottle finish. Tooled finish manufacturing was in use from the 1870s – 1920s (Rock 1990) and amethyst glass is a by-product of manufacturing methods in use between 1880 – c.1917 (Jones and Sullivan 1989).

Artifact 3 – An oval, colorless bottle base embossed with "(FU)LL PINT." The base also has a distinct Owen's machine suction scar 1904 – 1969 but was commonly seen on bottles manufactured in the United States from 1904 until the 1920s (Miller and Sullivan 1984, Toulouse 1969).

Artifact 4 – A colorless Brandy finish, either tooled finish or ABM.

12. Maximum Density - #/sq m (glass and ceramics):

13. Tin Cans:

Type	Opening	Size	Modified	Label/Mark	Function	#

Describe:

PART C - HISTORIC SITES

State No.: 26LN6830
Agency No.:
Temp No.: CYC-MG-1

14. Landscape and Constructed Features (locate on site map):

[ ] Trail/Road (TR)
[ ] Tailings (MT, ML)
[ ] Rock Alignment (R)
[ ] Hearth/Campfire (HE)
[ ] Dump (DU)
[ ] Depression (DE)
[ ] Cemetery/Burial (CB)
[ ] Quarry (QU)
[ ] Dam, Earthen (DA)
[ ] Ditch (DI)
[ ] Inscriptions (IN)
[ ] Other (OT)

Describe:

15. Buildings and Structures (locate on site map):

#	Material	TYPE	#	Material	TYPE

Describe:

16. Comments/Continuations:

Photographs

State No. 26LN6830
Agency No.
Temp. No. CYC-MG-1

26LN6830. Site overview. Facing 45˚ Camera 1, Rotation 1, Image 27.tif. Taken at 719870mE/4166594mN (NAD 83).

26LN6830. Site overview. Facing 27˚ Camera 1, Rotation 1, Image 32.tif. Taken at 719846mE/4166571mN (NAD 83).

Photographs

State No. 26LN6830
Agency No.
Temp. No. CYC-MG-1

26LN6830. Concentration 1 overview with rocky spine and depression. Facing 300˚ Camera 1, Rotation 1, Image 28.tif. Taken at 719870mE/4166594mN (NAD 83).

26LN6830. Concentration 1 overview. Facing 355˚ Camera 1, Rotation 1, Image 29.tif. Taken at 719870mE/4166594mN (NAD 83).

Photographs

State No. 26LN6830
Agency No.
Temp. No. CYC-MG-1

26LN6830. Detail of Concentration 2 debris. Camera 1, Rotation 1, Image 42.tif. Taken at 719790mE/4166534mN (NAD 83).

26LN6830. Detail of Artifact 1-Amethyst bottle base. Camera 1, Rotation 1, Image 21.tif. Taken at 719860mE/4166507mN (NAD 83).

Photographs

State No. 26LN6830
Agency No.
Temp. No. CYC-MG-1

26LN6830. Detail of Artifact 1- Amethyst bottle base. Camera 1, Rotation 1, Image 22.tif. Taken at 719860mE/4166507mN (NAD 83).

26LN6830. Detail of Artifact 2- Amethyst bottle finish. Camera 1, Rotation 1, Image 23.tif. Taken at 719860mE/4166604mN (NAD 83).

Photographs

State No. 26LN6830
Agency No.
Temp. No. CYC-MG-1

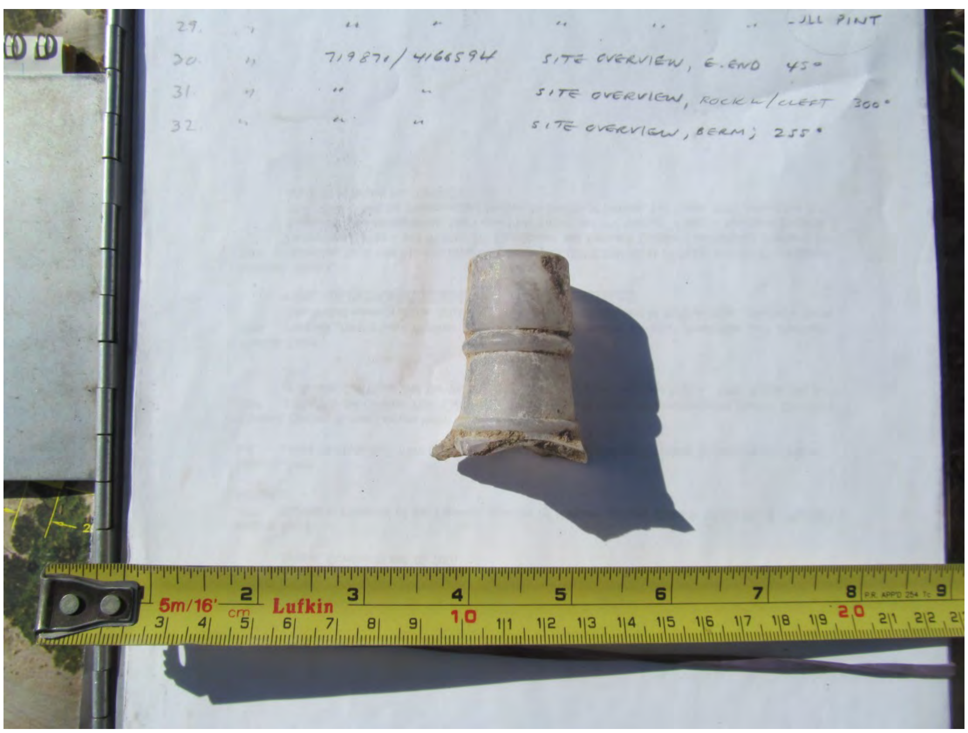
26LN6830. Detail of Artifact 2- Amethyst bottle finish. Camera 1, Rotation 1, Image 24.tif. Taken at 719860mE/4166604mN (NAD 83).

26LN6830. Detail of Artifact 3- Colorless bottle base. Camera 1, Rotation 1, Image 25.tif. Taken at 719873mE/4166598mN (NAD 83).

Photographs

State No. 26LN6830
Agency No.
Temp. No. CYC-MG-1

26LN6830. Detail of Artifact 3- Colorless bottle base. Camera 1, Rotation 1, Image 26.tif. Taken at 719873mE/4166598mN (NAD 83).

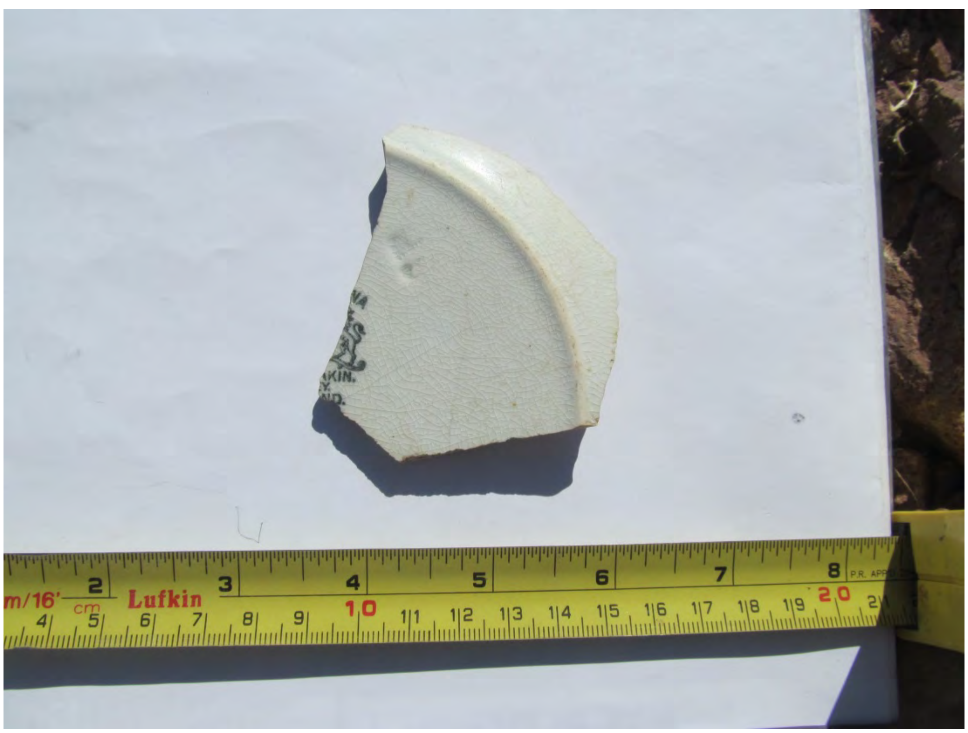


26LN6830. Detail of Artifact 4- Colorless bottle finish. Camera 1, Rotation 1, Image 30.tif. Taken at 719872mE/4166598mN (NAD 83).

Photographs

State No. 26LN6830
Agency No.
Temp. No. CYC-MG-1

26LN6830. Detail of Artifact 4- Colorless bottle finish. Camera 1, Rotation 1, Image 31.tif. Taken at 719872mE/4166598mN (NAD 83).



26LN6830. Detail of Artifact 5- Ceramic plate. Camera 1, Rotation 1, Image 33.tif. Taken at 719798mE/4166567mN (NAD 83).

Photographs

State No. 26LN6830
Agency No.
Temp. No. CYC-MG-1

26LN6830. Detail of Artifact 5- Ceramic plate. Camera 1, Rotation 1, Image 34.tif. Taken at 719798mE/4166567mN (NAD 83).

26LN6830. Detail of Artifact 6- Ceramic fragment. Camera 1, Rotation 1, Image 35.tif. Taken at 719797mE/4166567mN (NAD 83).

Photographs

State No. 26LN6830
Agency No.
Temp. No. CYC-MG-1

26LN6830. Detail of Artifact 6- Ceramic fragment. Camera 1, Rotation 1, Image 36.tif. Taken at 719797mE/4166567mN (NAD 83).

26LN6830. Detail of Artifact 7- Ceramic fragment. Camera 1, Rotation 1, Image 37.tif. Taken at 719796mE/4166566mN (NAD 83).

Photographs

State No. 26LN6830
Agency No.
Temp. No. CYC-MG-1

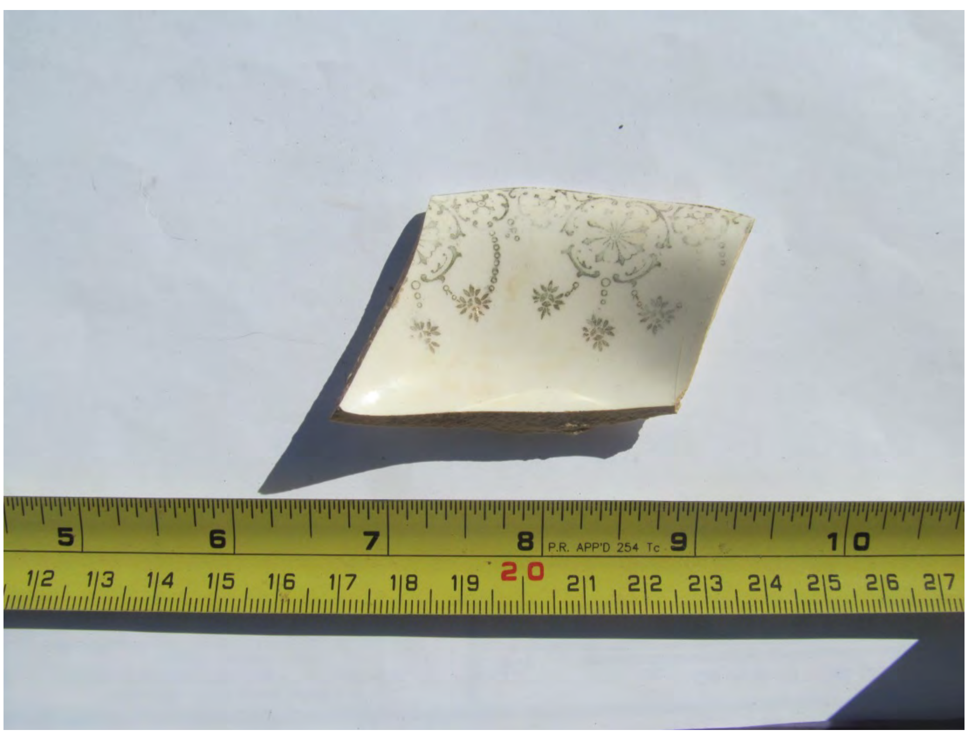
26LN6830. Detail of Artifact 7- Ceramic fragment. Camera 1, Rotation 1, Image 38.tif. Taken at 719796mE/4166566mN (NAD 83).

26LN6830. Detail of Artifact 8- Porcelain teacup rim. Camera 1, Rotation 1, Image 39.tif. Taken at 719796mE/4166564mN (NAD 83).

Photographs

State No. 26LN6830
Agency No.
Temp. No. CYC-MG-1

26LN6830. Detail of Artifact 8- Porcelain teacup rim. Camera 1, Rotation 1, Image 40.tif. Taken at 719796mE/4166564mN (NAD 83).



26LN6830. Detail of Artifact 9- Porcelain teacup rim. Camera 1, Rotation 1, Image 43.tif. Taken at 719791mE/4166535mN (NAD 83).

Photographs

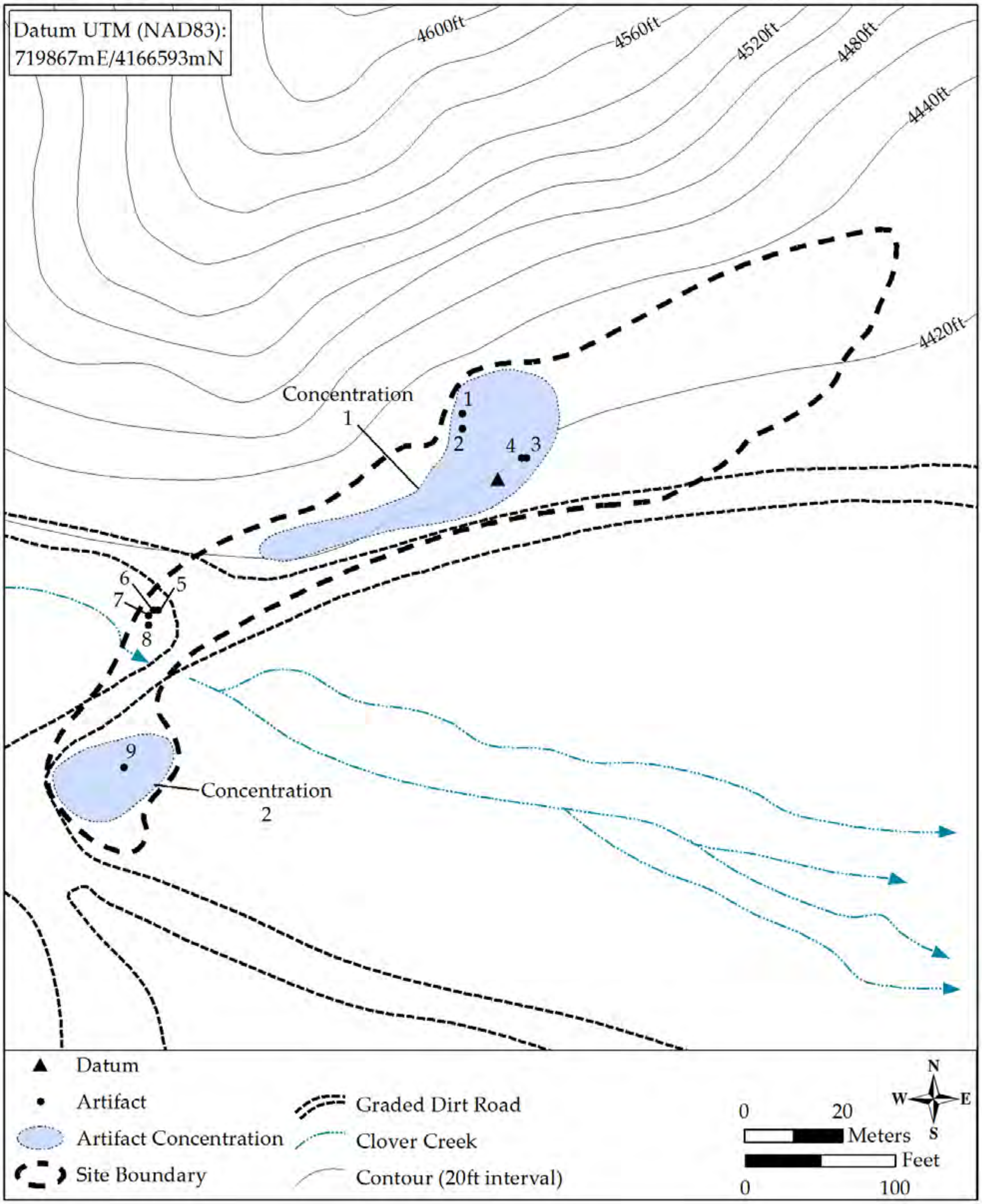
State No. 26LN6830
Agency No.
Temp. No. CYC-MG-1

26LN6830. Detail of Artifact 9- Porcelain teacup rim. Camera 1, Rotation 1, Image 44.tif. Taken at 719791mE/4166535mN (NAD 83).

Sketch Map

Drafted By: Montana M. Long, ASM Affiliates, Inc.
Data Collection Date: 5/25/2013

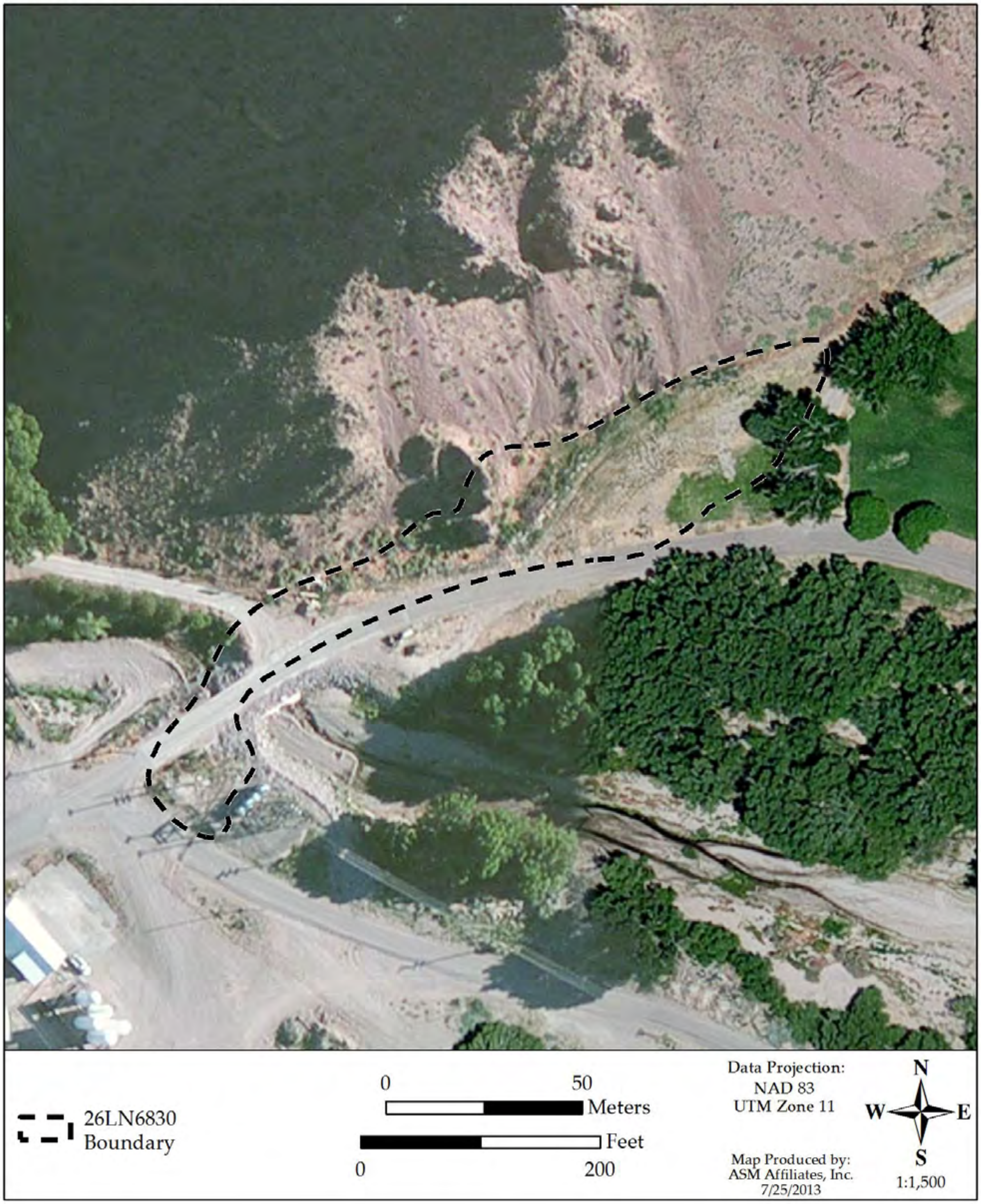
State No. 26LN6830
Temp No. CYC-MG-1



Location Map

Drafted By: Montana M. Long, ASM Affiliates, Inc.
Data Collection Date: 5/25/2013

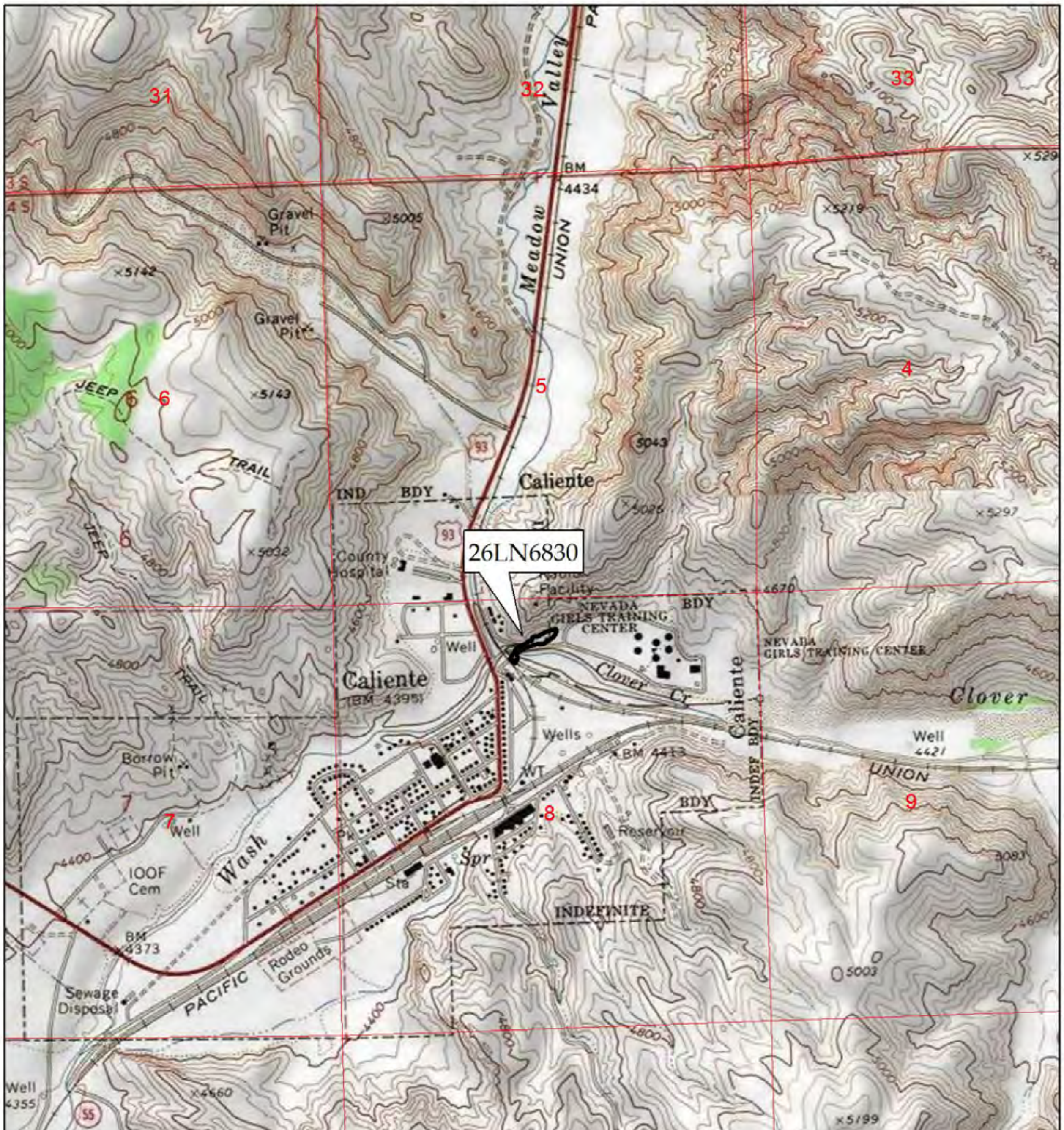
State No. 26LN6830
Temp No. CYC-MG-1



Location Map

Drafted By: Montana M. Long, ASM Affiliates, Inc.
Data Collection Date: 5/25/2013

State No. 26LN6830
Temp No. CYC-MG-1



Site Boundary

0 0.5 Kilometers

0 0.5 Miles

Data Projection:
NAD 83
UTM Zone 11
T4S R67E

Map Produced by:
ASM Affiliates, Inc.
7/25/2013

N S W E

1:24,000

APPENDIX B

Architectural Resource Assessment Form

1. | SHPO Resource Number: |
|---|
| Other ID Number: |

For SHPO Use Only
Lead Eligibility__________
SHPO Concurrence Y / N

NEVADA STATE HISTORIC PRESERVATION OFFICE
ARCHITECTURAL RESOURCE ASSESSMENT **(ARA)**
STRUCTURE FORM

2. PHOTO

3. PROPERTY OVERVIEW

URBAN ☐	RURAL ☒	
ADDRESS	n/a	
CITY, ZIP CODE	Caliente, Lincoln Co., NV	
ASSESSOR'S PARCEL #	n/a	
CONSTRUCTION DATE	1911	
SURVEY DATE	01/01/2013	
ACCESSORY RESOURCES TOTAL#	0	
ACCESSORY RESOURCES FORM(S) ATTACHED?	Yes ☐	No ☒
IMACS FORM(S) ATTACHED?	Yes ☐	No ☒

4. WRITTEN DESCRIPTION

The structure is an abandoned railroad bridge over Clover Valley Wash in northeastern Caliente, Lincoln County, Nevada. It was formerly a feature of the Caliente and Pioche (C&P) Railroad, a branch of the Union Pacific Railroad's Salt Lake Route. It is a common pony (thru-truss) plate-girder steel bridge supported by an abutment of vertical wooden pilings capped with a stacked beam-and-tie platform. The steel girders flanking the bridge are attached to the deck with knee braces. The deck itself consists of wooden railroad ties bolted directly to the substructure, which is composed of approximately ten floor beams that span the width of the bridge. The floor beams are connected by steel I-beam stringers and secured by narrow cross-beams along the bottom of the substructure. The steel bridge is approximately 60 ft. long and 8 ft. wide with 4-ft. high girders. One end of the bridge is connected to a short approach deck composed entirely of stacked beams and large wooden beam stringers with attached railroad ties. The supports under this approach appear temporary and may have been installed after 1938 when the original concrete footing was damaged by a flood (see Myrick 1963). Aside from the wooden ties remaining on the bridge deck, all other ties were removed along with the rails, and the bridge has apparently not been used for any purpose since the late 1960s.

A girder plate at one end of the bridge features a bolted-on steel plaque indicating the bridge was manufactured by the American Bridge Company of New York, U.S., 1911. The American Bridge Company (ABC) was the largest and most widely used manufacturer of pre-fabricated steel bridges during much of the twentieth century and is still in business (as American Bridge). ABC was formally incorporated in New Jersey in 1900 by J.P. Morgan and Company. It was an independent company for less than a year, when most of its stock was acquired by United States Steel Corporation, of which it became a subsidiary. That first year ABC also purchased 24 other bridge companies, representing most of its competitors and amounting to nearly 50 percent of the nation's steel bridge fabricating capacity. One of these new subsidiaries, the American Bridge Company of New York was responsible for all ABC sales, contracts, and erection from January 1901 to December 1913. ABC bridges of various designs for railroad or highway use were manufactured and partially pre-assembled at the factory, then packaged and shipped to the bridge site where installation was completed. Pony truss bridges were typically used on railroad grades because their shallow construction depth required little change in the height of the grade. Given that a devastating flood damaged much of the C&P track and Caliente facilities in 1910, installation of a new bridge over the Clover Valley Wash in 1911 is logical and indicates that the bridge is likely original to its location.

IF FURTHER SPACE NEEDED FOR WRITTEN DESCRIPTION, PLEASE ATTACH A SEPARATE CONTINUATION SHEET.

5. RECORDED BY: ASM Affiliates, Inc. *AGENCY REPORT NUMBER:* n/a

SHPO Resource Number:
Other ID Number:

6. Integrity & Condition

Integrity:	Original ☒	Intact ☐	Altered ☐	Moved ☐	Date(s):
Condition:	Excellent ☐	Good ☒	Fair ☐	Poor ☐	Other ☐
If Other, Describe:					

7. Property Information

Historic Name	n/a
Current/Common Name	Caliente & Pioche Railroad Bridge
Original Owner	Union Pacific Railroad
Current Owner & Mailing Address	City of Caliente
Architect/Engineer/ Designer	American Bridge Company of New York
Building/Contractor	American Bridge Company of New York

8. Bridge Description (if applicable)

Span	n/a
Form	Pony truss plate girder
Material	Steel
Balustrade Description	Plate girders
Number of Piers	2
Length	60 ft
Width/Travel Lanes	8 ft

9. UTM Location/Reference(s)

Zone: 11	Easting: 719739	Northing: 4166553
Zone: 11	Easting: 719714	Northing: 4166584

10. Township/Range/Section/Map

Township: 4S	Range: 67E	Section: 8	USGS Map/Date: USGS 1970 Caliente, NV 7.5

11. Threats to Resource

None - bridge was assessed as part of the Caliente Youth Center Bridge Flood Mitigation Project (07-S04) but will not be affected by said undertaking.

12. National Register Eligibility

NR Listed ☐	Date NR Listed:			
Eligible Under:	Criterion A ☐	Criterion B ☐	Criterion C ☐	Criterion D ☐
Not Eligible ☒				
Unevaluated ☐				
Historic Themes: Transportation, Railroads				
Eligibility Justification: Please attach continuation sheet.				

13. ELIGIBILITY JUSTIFICATION

Caliente in Lincoln County, Nevada, began as a railroad town in 1902 when the Salt Lake to Los Angeles route of the Union Pacific Railroad (UPRR) was completed between Uvada (on the Utah-Nevada border) and Caliente. Prior to the arrival of the railroad, Caliente was known as Culverwell (or Culverwell Ranch) for its owner Charles Culverwell who settled in the area in 1875. In 1901, Culverwell built a hotel at the hot springs in Caliente, evidently anticipating that the hot springs might become a railroad resort destination. Instead, Caliente became an important railroad company town, second only to Las Vegas along the Salt Lake Route. Its population peaked circa 1910 with more than 1,700 persons, and an array of stores, saloons, hotels, livery stables and other commercial enterprises catered to the community. Rows of company houses flanked the UPRR depot and a large roundhouse and shops at the east side of town, where a wye connected the main line with the Caliente & Pioche (C&P) Railroad. The C&P, a branch of the UPRR extending north to Panaca/Bullionville and on to Pioche, was completed in 1907.

Construction of the Salt Lake Route had been slow and hampered by multiple litigious bouts between UPRR subsidiaries (controlled by E. H. Harriman) and those of the competing San Pedro, Los Angeles and Salt Lake Railroad Company (controlled by Senator William A. Clark). Additionally, during the early 1900s much of Nevada's population was actively engaged in mining or mining-associated activities, and railroad companies found it difficult to assemble the tremendous work force necessary to build the roads. UPRR contractors "imported" work crews of European immigrants, both skilled and unskilled, who were willing and able to perform manual labor under poor conditions and for little pay. Caliente was initially a "tent city" of Irish, Italian, Austrian, Greek and Syrian labor camps, and even after the railroad was complete a large labor force was required to maintain it in the wake of nearly continuous floods and storm damage. Highly disastrous floods in 1907 and 1910 damaged large segments of the new railroad and wreaked havoc on its depot and shops in Caliente. Although improvements were made through the 1920s to prevent wholesale destruction, periodic flooding of the Meadow Valley and Clover Valley drainages continues to the present time.

Caliente and its railroads prospered until the 1940s, when U.S. 93 was built and truck transportation replaced rail shipping of freight, livestock and mineral ores. The mines in Pioche, which operated intermittently during the first half of the twentieth century, closed for good in the late 1950s, and the C&P route was abandoned. The roundhouse and shops had long been dismantled and removed, rails and ties were eventually pulled up, and only a few traces of the former C&P grade are currently visible along with a single railroad bridge over Clover Valley Wash. The UPRR main line continues to operate between Salt Lake City and southern California where it intercepts the Atchison-Topeka-Santa Fe into Los Angeles. Caliente is now a sleepy highway community with a resident population of several hundred. Recently, the town was identified as a potential transfer station for nuclear waste on its way to Yucca Mountain.

Because this bridge lies outside the direct and indirect Area of Potential Effect (APE) of the Caliente Youth Center Bridge Flood Mitigation Project (07-S04), it was not evaluated for National Register of Historic Places eligibility during the present study.

References:

American Bridge Company
2013 Electronic document located at http://www.sia-web.org/occasionalpub/AmericanBridges/directory/AppendixC.pdf. Accessed July 12, 2013.

Carlson, Helen S.
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Deseret News
1902 American Bridge Company of New York. March 29, 1902, page 11. Deseret News, Salt Lake City, Utah.

Hulse, J. W.
1971 Lincoln County Nevada: 1864-1909. University of Nevada Press Reno, Nevada.

Myrick, D. F.
1963 Railroads of Nevada and Eastern California. Volume Two – The Southern Roads. Howell-North Books, Berkeley.

SHPO Resource Number:
Other ID Number:

14. Location Maps & Site Plans

15. PHOTOGRAPHS

Façade: Overview Facing: N Photographer: ASM Affiliates, Inc. Date: 05/31/2013

Façade: Overview Facing: NE Photographer: ASM Affiliates, Inc. Date: 05/31/2013

Appendix F – Biological Study

U.S. Department of Homeland Security
Region IX
1111 Broadway, Suite 1200
Oakland, CA 94607-4052

FEMA

September 4, 2013

Mr. Michael Senn
Assistant Field Supervisor
U.S. Fish and Wildlife Service
Southern Nevada Fish and Wildlife Field Office
4701 N. Torrey Pines Drive
Las Vegas, NV 89130

RE: PDM-PJ-09-NV-2012-002
Subapplicant: State of Nevada Public Works Division

The Nevada Public Works Division (Subapplicant) has submitted an application through the State of Nevada Division of Emergency Management (NDEM)(Grantee) for federal financial assistance from the Department of Homeland Security's Federal Emergency Management Agency (FEMA) Pre-Disaster Mitigation Grant Program (PDM) to remove existing culverts and replace them with a new bridge structure just east of the confluence of Clover Creek Wash and Meadow Valley Wash in the incorporated City of Caliente, Lincoln County, Nevada. The new bridge would allow for sufficient flows in Clover Creek to pass during flood events and maintain access to the north side of the wash during high water.

FEMA has reviewed the U.S. Fish and Wildlife Service's list of federally listed species for Lincoln County and has identified that out of nine listed species only two bird species, the Yellow-billed cuckoo (*Coccyzus americanus*) a candidate species and the Southwestern willow flycatcher (*Empidonax traillii extimus*) an endangered species have any potential for occurring within or immediately adjacent to the proposed project action area. For all of the other federally-listed species the proposed project action area is either clearly outside of the known geographic or elevation range; the project action area does not contain habitat characteristics known to support the species; or, the habitat conditions and level of existing disturbances is too great.

FEMA's Subapplicant has retained the services of a biologist who completed surveys for the Southwestern willow flycatcher and the yellow-billed cuckoo (enclosed). Neither the Southwestern willow flycatcher nor the yellow-billed cuckoo was observed during the surveys. However the habitat surrounding the project action area contains a variety of willow species with a mixture of native broadleaf trees and shrubs and a distinct overstory which could be suitable for use by the Southwestern willow flycatcher during migration. FEMA has determined that the proposed work is not likely to adversely affect or jeopardize the continued existence of any threatened or endangered species or modify any critical habitat pursuant to Section 7 of the Endangered Species Act and 50 CFR Part 402.

FEMA understands that the project site is located in the Pacific flyway and that several species of migratory birds may pass through or even use areas proposed project action area. FEMA will, through the grant conditions, notify the Grantee of their responsibilities pursuant to the Migratory Bird Treaty Act and EO 13186 and require the Grantee to consult with the Service regarding the project's potential impacts to migratory birds. In addition, the grant will be conditioned such that no construction would take place between April and July and that a pre-construction survey be conducted.

If you have any questions or require any additional information please do not to contact me at donna.meyer@fema.dhs.gov or at (510) 627-7728.

Sincerely,

Donna M. Meyer, CEM/HPS
Deputy Regional Environmental Officer
Non-Disaster Grant Programs

Enclosure

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Nevada Fish and Wildlife Office
4701 North Torrey Pines Drive
Las Vegas, Nevada 89130
Ph: (702) 515-5230 ~ Fax: (702) 515-5231

Date: September 19, 2013
File No. 84320-2013-I-0345

Ms. Donna Meyer
Non-Disaster Grants Program, FEMA
U.S. Department of Homeland Security
Region IX
1111 Broadway, Suite 1200
Oakland, California 94607-4052

Dear Ms. Meyer:

Subject: Informal Consultation for the Bridge Project in the City of Caliente, Lincoln County, Nevada

On September 9, 2013, we received your letter determining the subject project may affect but would be unlikely to adversely affect the southwestern willow flycatcher (*Empidonax trailii extimus*), a species listed as endangered, and the yellow-billed cuckoo (*Coccyzus americanus*), a candidate species proposed for listing, under the Endangered Species Act of 1973, as amended (Act) (16 U.S.C. 1531 et seq.). The Federal Emergency Management Agency (FEMA) proposes to provide financial assistance to the State of Nevada Division of Emergency Management to remove and replace existing culverts just east of the confluence of Clover Creek Wash and Meadow Valley Wash in the City of Caliente with a new bridge structure. The new bridge would allow for sufficient flows in Clover Creek Wash to pass during flood events and maintain access to the north side of the wash during high water.

Our response to your request for informal consultation is enclosed. If we can be of further assistance, please contact Susan Cooper in the Nevada Fish and Wildlife Office in Las Vegas at (702) 515-5230.

Sincerely,

Edward D. Koch (FOR)

cc:
Supervisory Biologist - Habitat, Nevada Department of Wildlife, Las Vegas, Nevada

Enclosure

INFORMAL CONSULTATION

Action Area

The proposed project is located in the City of Caliente, Lincoln County, Nevada, along the Clover Creek Wash upstream of where its confluence with Meadow Valley Wash (MVW) occurs (Figure 1). Clover Creek Wash enters the community from the east and meets MVW at the Union Pacific Railroad Bridge. Recurrent flooding events coupled with construction of several flood-protection reservoirs have resulted in sediment aggradation and debris buildup in culverts on Clover Creek, creating a chronic maintenance problem for the City of Caliente. The road that crosses over Clover Creek is the single point of access to the Caliente Youth Center and Hot Springs Motel. Flows from a 2005 flood event, exceeded culvert capacity and overtopped the roadway by three to five feet, jeopardizing the safety of residents and staff of the Caliente Youth Center by preventing emergency vehicle access for evacuation of the facility. The action area includes the locations where construction would occur and a 100-meter buffer area downstream of the construction locations where vegetation may be impacted by project actions (e.g., sedimentation movement).

Description of Proposed Action

To resolve flooding problems in this area, FEMA proposes to finance a project to remove the two existing twelve-foot half-pipe culverts and concrete headwall and replace them with a bridge that will be able to convey 100-year event flood flows without overtopping the road. The proposed project would include staging sites; fencing; removal of debris and sedimentation; excavation of existing culverts and water and sewer infrastructure; installation of single-span bridge and walls; reconstruction of the road surface after bridge installation; relocation and installation of water and sewer infrastructure; and installation of riprap and revegetation both upstream and downstream of the bridge. Construction for the project is estimated to take approximately 120 days.

FEMA has proposed the following grant conditions to minimize impacts to the southwestern willow flycatcher (flycatcher) (*Empidonax trailii extimus*), the yellow-billed cuckoo (*Coccyzus americanus*), and other migratory birds occurring in the project area:

1. No construction would take place between April through July;
2. A pre-construction bird survey would be conducted prior to initiation of construction.

Southwestern willow flycatcher

Although flycatchers have not been observed breeding in the project area, evidence of breeding flycatchers was documented in 2013 approximately 11 miles south of the project in MVW. Active nests were also located in habitat in Rainbow Canyon prior to 2000. Suitable habitat for flycatchers occurs in small patches along the entirety of MVW; however, the likelihood of breeding flycatchers in the project area is low.

Passive listening surveys for southwestern willow flycatchers were conducted along a 0.6-mile stretch of the Clover Creek Wash and MVW confluence area in June and July 2013. No willow flycatchers were documented.

Yellow-billed cuckoo

The yellow-billed cuckoo (cuckoo) has consistently been documented over the last 10 years during the breeding season approximately 7 miles south of the project area in MVW. Suitable habitat for the cuckoo occurs in small patches along the entirety of MVW; however, the likelihood of breeding cuckoos in the project area is low.

Protocol surveys for yellow-billed cuckoos were conducted along a 0.6-mile stretch of the Clover Creek Wash and MVW confluence area in June and July 2013. No cuckoos were documented.

Effects

Habitat occurring in the action area may be used by southwestern willow flycatchers and yellow-billed cuckoos for foraging or migrating between April and September. As a result of project activities, foraging and migrating flycatchers and cuckoos may be displaced. However, effects to flycatchers and cuckoos as a result of displacement would be insignificant as there is sufficient nearby native vegetation that they can use for foraging or for cover.

Due to the temporary nature of impacts to potential flycatcher and cuckoo habitat and the lack of documented use of this area by flycatchers and cuckoos, the proposed action is not expected to result in a stress on resources, behavior, or nesting opportunities for the flycatcher. In addition effects to the species will be minimized because project activities would occur outside of the flycatcher and cuckoo breeding seasons. Effects to flycatchers and cuckoos as a result of displacement would be insignificant as there is sufficient nearby native vegetation that they can use for foraging or cover.

Based on the above information and the recommended minimization measures, the Fish and Wildlife Service concurs that the proposed project *may affect but is not likely to adversely affect* the southwestern willow flycatcher or yellow-billed cuckoo. This response constitutes informal consultation under regulations promulgated in 50 CFR § 402.14, which establishes procedures governing interagency consultation under section 7 of the Endangered Species Act of 1973, as amended. This informal consultation does not authorize any *take* of southwestern willow flycatchers or yellow-billed cuckoos

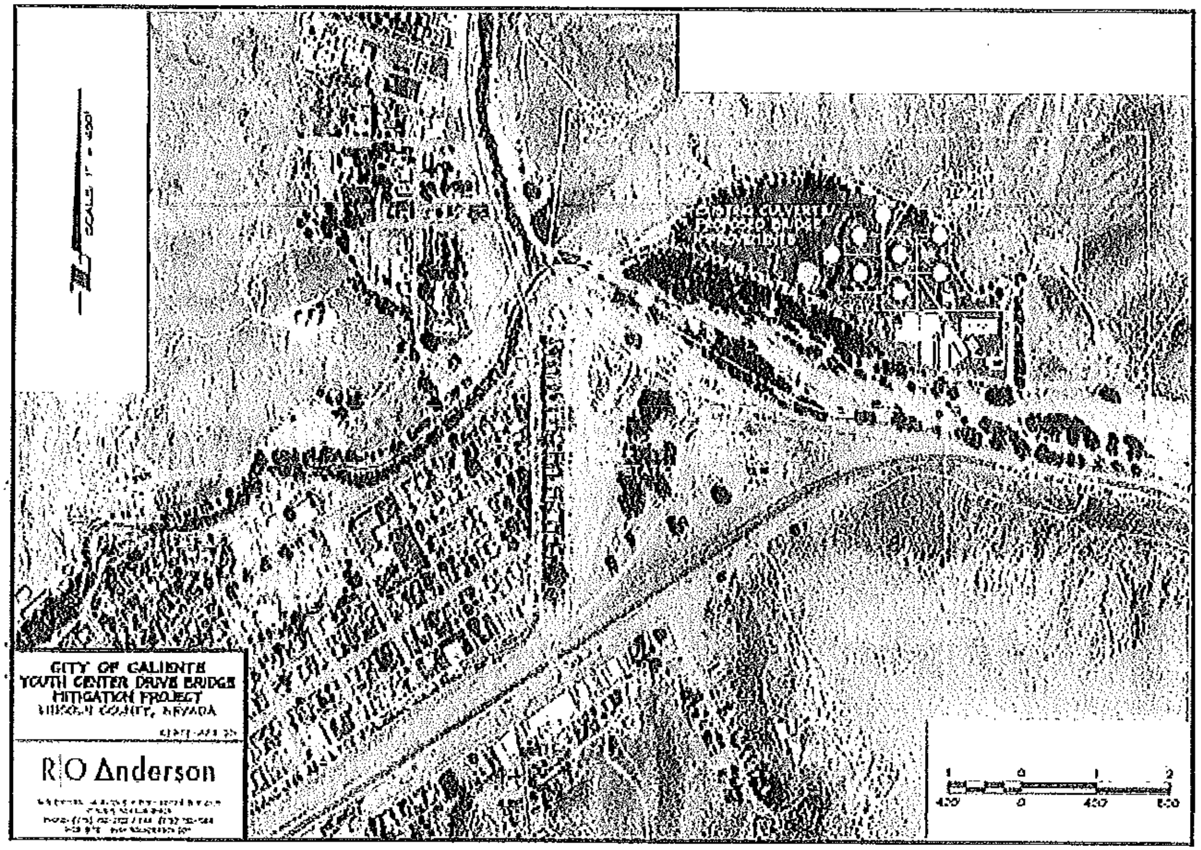

Figure 1. Proposed project location along the Clover Creek Wash in the City of Caliente, Lincoln County, Nevada.

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8 August 2013

Ms. Coleen Shade
RO Anderson Engineering
595 Tahoe Keys Blvd, Suite A-2
South Lake Tahoe, CA 96150

RE: Caliente Youth Center Bridge Flood Mitigation Project, 2013 Southwestern Willow Flycatcher and Yellow-Billed Cuckoo Survey Results

Dear Ms. Shade:

The biological surveys for the 2013 field season have been completed for the Caliente Youth Center Bridge Flood Mitigation Project. These surveys are being performed to provide background data and information to allow completion and adequate analysis of an Environmental Assessment that is to be prepared for the subject project to satisfy the requirements of the National Environmental Policy Act. Surveys were performed for two species within the project area: southwestern willow flycatcher (*Empidonax traillii extimus*) and yellow-billed cuckoo (*Cuccyzus americanus occidentalis*). A summary of the survey methods, results and recommendations are provided below.

The proposed Caliente Youth Center Bridge Flood Mitigation Project is located at the northern portion of they incorporated City of Caliente. Caliente, NV is located in central eastern Lincoln County on Highway 93, approximately 150 miles north of Las Vegas, NV and 130 miles south of Ely, NV. The Project is located just to the east of the confluence of Clover Creek Wash and Meadow Valley Wash at an elevation of 4,400 feet above mean sea level. The Project proposes to remove the culverts, which currently allow for the roadway (Youth Center Drive) crossing of Clover Creek and replace them with a new bridge structure. The new bridge crossing will allow for sufficient flows in Clover Creek to pass during flood events and maintain access to the north side of the wash during high water. For a detailed description of the proposed project including a vicinity map and map showing the location of the proposed bridge structure and existing culvert locations, please refer to Appendix A - Project Description. Photographs of the Project site and surrounding habitats are provided in Appendix B - Site Photographs.

Site Characteristics:

The proposed project crosses Clover Creek Wash just to the east of its confluence with Meadow Valley Wash. Meadow Valley Wash often flows up to 35 cfs in the winter and early spring months and then flows decrease significantly during the summer and remaining months of the year (Bio-West 2005). Clover Creek exhibits a similar annual flow pattern to Meadow Valley Wash. During the site visits in 2013, Clover Creek did not have any measureable flow in the project vicinity, however standing water was noted between the confluence and the Project site.

The habitat types in the immediate project vicinity were noted as Railroad/Road, Developed Lands, Riparian Forest, and Coyote Willow Shrubland. The habitat types that occur within the project area are described below. Descriptions follow the Meadow Valley Wash Ecological Assessment (Bio-West 2005):

Riparian Forest: The riparian forest in the vicinity of the project along the banks of Clover Creek and Meadow Valley Wash is composed of a co-dominant mixture of Fremont cottonwood (*Populous fremontii*) and red willow (*Salix laevigata*) forming a canopy from 20 to 40 feet tall. This vegetation type has a multi-storied canopy structure with a diverse understory of *Salix spp*. and cattails (*Typha spp.*) Interspersed within the riparian forest and more dominant at the confluence of Meadow Valley Wash and Clover Creek are patches of coyote willow shrubland.

Coyote Willow Shrubland: This vegetation type is composed of very dense nearly monotypic stands of coyote willow (*Salix exigua*). Coyote willow shrubland was observed from 5 to 20 feet tall mostly along the banks of Meadow Valley Wash and in the vicinity of the confluence with Clover Creek. Seepwillow (*Baccharis salicifolia*), and cattails were observed along the banks in conjunction with the *Salix*.

Developed Lands: Developed lands include the Caliente Youth Center, parking lots, residential development and an electrical substation, and dirt access roadways to the streambed. The dry creek bed in the immediate area of the project site was mostly void of vegetation due to disturbance from off-rad vehicle travel and heavy equipment movement of streambed materials.

Railroad/Road: US Highway 93 as well as Youth Center Drive cross the riparian area in the immediate project vicinity. An existing abandoned railway bridge also exists that crosses Clover Creek immediately adjacent to the confluence with Meadow Creek Wash.

As the habitat surrounding the Project site contains a variety of willow species with a mixture of native broadleaf trees and shrubs, a variety of class sizes, with a distinct overstory it may be suitable use by the Southwester willow flycatcher. However as the riparian habitat along Meadow Creek Wash is less linear in fashion and less than 30 feet in width the suitability of the habitat is decreased for breeding but may be used during migration (Sogge et. al. 2010).

The Riparian Forest that occupies the banks of Clover Creek and Meadow Valley Wash adjacent to the project area also provides suitable habitat for the yellow-billed cuckoo with dense parches of cottonwood with a moderate to thick understory in close proximity of water (Hughes 1999). However, due to the relative small size of the habitat patch adjacent to the Project site (less than 8 acres and less than 6 acres of closed canopy) the suitability of the Riparian Forest adjacent to the project site for breeding yellow-billed cuckoo is marginal (Laymon 1998).

For detailed habitat requirements, breeding biology and demography for both the southwestern willow flycatcher and yellow-billed cuckoo please refer to Appendix C and D respectively.

Methods:

Southwestern willow flycatcher: Surveys for southwestern willow flycatcher were performed a total of four times during the months of May, June and July 2013. Survey dates in 2013 were as follows: May 31, June 25, June 30 and July 14th. A Recovery Permit was not issued by USFWS for surveying the area to protocol, therefore a passive survey methodology was used for all suitable habitat 1000 feet to the east of the proposed Project up Clover Creek and also 1000 feet to the west along Meadow Valley Wash. Passive survey methodology included active aural and ocular searches of the riparian habitat along these two drainages. No recordings were broadcast into the habitat due to the lack of a Recovery Permit as the application was being processed by USFWS. The survey protocol for southwestern willow flycatcher can be found in Appendix C.

Yellow-billed cuckoo: Surveys for yellow-billed cuckoo were performed a total of three times during the months of June and July 2013. Survey dates in 2013 were as follows: June 25, June 30 and July 14th. The Draft Yellow-billed Cuckoo Survey and Monitoring Protocol for California (Laymon 1998) was utilized for the surveys. Details of the yellow-billed cuckoo protocol can be found in Appendix D.

Results:

No southwestern willow flycatcher were detected during the passive surveys performed over the four survey dates noted above. Survey forms are located in Appendix E.

No yellow-billed cuckoo were detected during protocol surveys. Survey forms are located in Appendix E.

A total of 35 other avian species were observed during passive and protocol surveys. One yellow warbler nest (*Setophaga petechial*) was located in a cottonwood 15’ off the ground on the southern bank of Clover Creek approximately 600 feet from the Youth Center Drive crossing. One common yellowthroat nest was located in Salix along the margins of Meadow Valley Wash south of the confluence. One American robin (*Turdus migratorius*) nest was located in a cottonwood on the north side of Clover Creek approximately 350 feet from the Youth Center Drive Crossing. A full list of wildlife species observed can be found in Appendix E.

Discussion and Recommendations:

The proposed construction of the new bridge span will result in the minor removal of existing vegetation along the northern bank of Clover Creek Wash. The vegetation to be removed include planted and irrigated *Juniperus sp.*, *Betula occidentallis* and native *Salix exigua*. The suitability of this vegetation for willow flycatcher and yellow-billed cuckoo is low due to the existing human development and activity present. Youth Center Drive is immediately adjacent to the vegetation that is to be removed and is occupied by vehicle traffic on a relatively constant basis. A driveway to a private property hotel/residence is immediately to the north of the vegetation to be removed thereby isolating the vegetation from any remaining patch of suitable habitat. Additionally, Highway 93 also crosses the riparian area just to the south of the proposed project location which increases the background noise in the area together with the electrical substation on the south side of Clover Creek.

No willow flycatcher were observed during the passive surveys, as were no yellow-billed cuckoo; therefore no impacts to these species as a result of construction and operation of the proposed project should occur. However, due to the fact that protocol surveys for willow flycatcher were not performed due to the lack of a Recovery Permit being authorized early enough in the season, protocol surveys should be performed in 2014 if construction/vegetation removal has not occurred prior to May 2014. These protocol surveys would ensure the detection and subsequent protection of migrating or resident willow flycatchers should they occur in 2014.

Sincerely,

Garth Alling
Senior Biologist
Hauge Brueck Associates, LLC

Appendix A: Project Description
Appendix B: Site Photographs
Appendix C: Southwestern Willow Flycatcher Protocol
Appendix D: Yellow-Billed Cuckoo Survey Protocol
Appendix E: Species List
Appendix F: Survey forms

References:

BIO-WEST Inc. March 2005. Meadow Valley Wash Final Baseline Ecological Assessment, 105p.

Sogge, M.K., Ahlers, Darrell, and Sferra, S.J., 2010, A natural history summary and survey protocol for the southwestern willow flycatcher: U.S. Geological Survey Techniques and Methods 2A-10, 38p.

Hughes, J.M. 1999. Yellow-billed Cuckoo (*Coccyzus americanus*). *In*: A. Poole and F.B. Gill, editors. The Birds of North America. No. 418. The Birds of North America, Inc., Philadelphia, PA.

Laymon, S.A. 1998. Yellow-billed Cuckoo (*Coccyzus americanus*). *In*: The Riparian Bird Conservation Plan: a strategy for reversing the decline of riparian-associated birds in California. California Partners in Flight. [Online: www.prbo.org/calpif/htmldocs/riparian_v-2.html]

Appendix A: Project Description

SCOPE OF WORK

Caliente Youth Center Bridge Flood Mitigation Project

Caliente, Nevada

Submitted to

United Stated Department of Homeland Security
Federal Emergency Management Agency

Submitted by

State of Nevada
State Public Works Division

October 10, 2011

Community Information

Lincoln County is located in southeastern Nevada, north of Las Vegas and south of Ely. The county is adjacent to both Utah and Arizona on the east, Nye County to the west, White Pine County to the north, and Clark County to the south. Lincoln County is the third largest county in Nevada with a land area of 10,650 square miles (6,816,000 acres). It comprises an area the size of the state of Maryland with 98% of the total land are being managed by the Federal Government. The City of Caliente is located in eastern Lincoln County. The city is approximately 100 miles (155 highway miles) north of Las Vegas and approximately 110 miles south of Ely, Nevada. The city is surrounded by unincorporated areas of Lincoln County. Caliente is the only incorporated community in Lincoln County.

Lincoln County is primarily rural with an estimated population of 4,523. Current unemployment rates for Lincoln County from Bureau of Labor Statistics for May 2011 are 12.3%, 2.2 percent over the national unemployment rate of 9.1% for the same month. According to the U.S. Census, 1,015 persons resided in the City of Caliente in 2000. However, the U.S. Census 2005-2009 American Community Survey 5-Year Estimates reports a decline in population to 799. The median household income in Caliente is $26,471, 51% of the U.S. median household income. Unfortunately, because the applicant and owner of the project site is the State of Nevada, this application does not qualify under the small, impoverished community status according to FEMA's Unified Hazard Mitigation Assistance Program's regulations. Nevertheless, the City of Caliente is most definitely a small, impoverished community.

Founded as a railroad town, the City of Caliente is key commercial center to the county. Commercial development in Caliente has taken place along both sides of portions of U.S. Highway 93 and along the central portion of Clover Street in proximity to the Meadow Valley Wash. Major institutions such as the county-wide Grover C. Dils Medical Center (a full service hospital), Bureau of Land Management Offices, and the State of Nevada operated Caliente Youth Center are present in Caliente. The project site is located along Youth Center Drive, the access road to the Caliente Youth Center which employs approximately 100 people.

Historically, mining and agriculture and to a lesser extent government, have been the most constant economic activities in Lincoln County. However, employment for both mining and agriculture are declining. The City of Caliente is provided electrical power by the Lincoln County Power District # 1 and telephone service by the Lincoln County Telephone Company. The electrical power substation, which serves as the City's only power source, and telephone lines are located adjacent to the project site.

Caliente's climate is typical of the Great Basin's "basin and range" topography with dry valleys and moister mountain ranges. Temperatures range from well below freezing in the winter up to the mid 90's in the summer. Total average annual precipitation is 9.04 inches. Most precipitation in the drainage areas results from general winter storms. The winter storm rainfall is usually of low intensity. Storms occurring during the summer are of two types: the comparatively infrequent general summer storms and the more common local, or cloudburst, summer storms. The former cover comparatively large areas and sometimes include cells of high-intensity, short duration rainfall. The cloudburst storms are generally of short duration but may result in heavy rain over a small area.

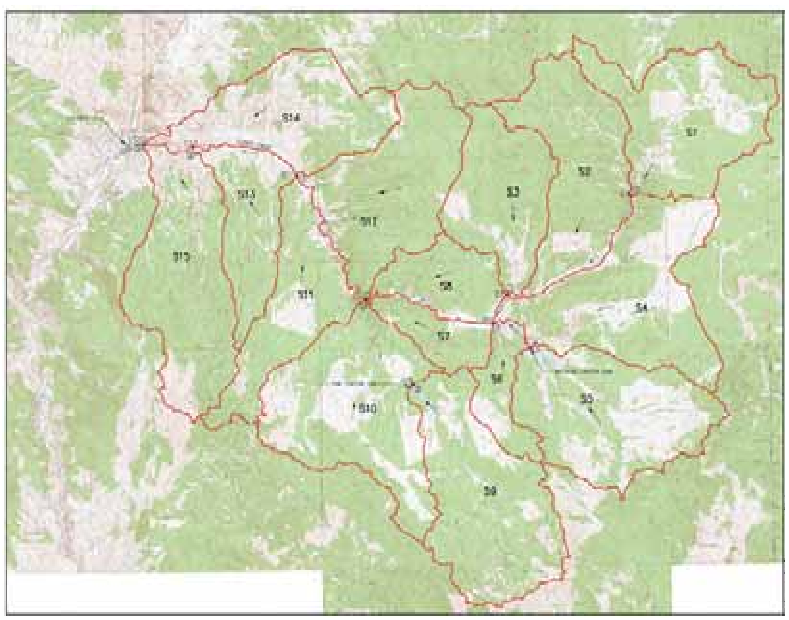
Located adjacent to the confluence of the Meadow Valley Wash and Clover Creek Wash, the City of Caliente is physically constrained by steep canyon walls and has been subject to numerous flood events recorded in 1910, 1938, and 1970, 2005, and 2010, which have inundated vast areas of the town. Meadow Valley Wash enters the community from the north and leaves the corporate limits at the southwestern corner of the city. The drainage area at the USGS stream gage site near Caliente is 1,227 square miles.

----- **Clover Creek Watershed**

----- **Meadow Valley Watershed**

Clover Creek Wash is a major tributary to the Meadow Valley Wash and its watershed area is 258 square miles at its mouth. Clover Creek Wash enters the community from the east and has its confluence at the Union Pacific Railroad bridge located near the proposed project site. According to new floodplain surveys, much of the town is in the 100-year flood plain.

Numerous problems in Caliente are attributable to flow of water and sediment from Meadow Valley Wash and Clover Creek watersheds, including: flooding, property damage, sedimentation, high groundwater, sewer system damage, threat to city and county properties, threat to highway and railroad crossing structures, and threat to environmental and biological conditions along the drainageways. Erodible soils are present on the Meadow Valley Wash and Clover Creek Wash watersheds and sediment loads from these watersheds were exacerbated by human activities. The original construction of the Youth Center Drive crossing of Clover Creek Wash comprised two 12-foot diameter culverts for drainage conveyance. These culverts provide sufficient capacity for relatively frequent events, but are significantly undersized for severe flood events. Therefore, the crossing impounds flows during events that exceed the capacity of the structures (during severe flood events). The issue is compounded by substantial sediment volumes, which are a natural part of the Clover Creek – Meadow Valley Wash system.



Clover Creek Watershed

Furthermore, flood flow conveyance and sediment transport were modified by flood control structures placed upstream from the project site by the U.S. Army Corps of Engineers. The Pine Canyon and Mathews Canyon flash flood control structures in the Clover Creek watershed upstream from Caliente reduce historical flushing floods. That impact was the intent of these structures. However, although flood flows are reduced, they are not eliminated and severe floods continue to occur in conjunction with substantial sediment flows. While the dams reduce damage during flood events, the reduced flows perpetuate chronic channel maintenance problems attributable to sediment deposition and continue to present hazards to infrastructure and natural resources. Regardless of maintenance efforts, the combination of substandard culverts and sedimentation can only be resolved with replacement of the culvert with a spanning structure (bridge).

The City of Caliente has made several attempts to obtain funding from grants and other programs in order to resolve the problem at the Caliente Youth Center bridge to no avail. Additionally, through Senate Bill 579, $300,000 was appropriated toward the project; however this funding has since been pulled. The City has remained diligent in their efforts to excavate sediment from the culverts utilizing their staff and a track hoe purchased with a legislative grant through the Army Corps of Engineers. Between the 2005 and 2010 floods, the City excavated approximately 6 to 8 feet of sediment. These efforts minimized the damage caused by the 2010 flood flows which were estimated to be equal to or more than the 2005 flows. However, the 2010 flood re-deposited approximately 5 feet of sediment. The local government is rapidly depleting its limited financial and personnel resources while making every effort to address these flooding problems that are significantly impacting their community.

Photographs taken of the project site June 2011.

Problem Description

The Caliente Youth Center (CYC) is located in Caliente, Nevada. The facility provides correctional care for as many as 140 children committed to the care of the Nevada State Division of Child and Family Services. The staff-secure facility has 7-housing units, four units for males and three for females age 12-18. The CYC is the only state-operated correctional facility for females. This center, along with the Lincoln County School District, operates school programs that offer required and elective academic subjects, remedial programs, special education, vocational education and interscholastic activities. In addition, the CYC employs as many as 100 state personnel.

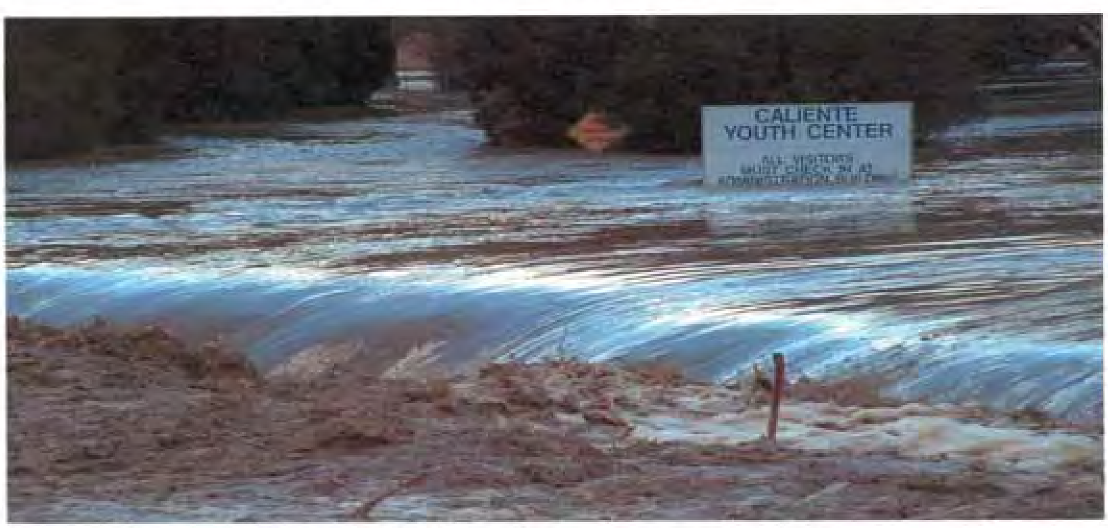
Youth Center Drive is the single point of access to both the CYC facility and the Hot Springs Motel. The road crosses Clover Creek near the confluence of Clover Creek and Meadow Valley Wash. The crossing comprises two, twelve-foot half-pipe culverts and a concrete headwall. While these culverts provide sufficient capacity for relatively frequent events, they are significantly undersized for severe flood events. Recurrent flooding from heavy precipitation events in the adjacent higher elevations coupled with construction of several flood-protection reservoirs resulted in sediment aggradation and debris buildup in the Clover Creek culverts. Sediments generated from a 5-year, 24-hour storm event can create channel bed aggradations up to 3 feet at the upstream end of the culvert, which will totally block the culvert entrance. The excessive sediment and debris deposition and flooding is a chronic maintenance problem for Caliente. While the City has made significant efforts to reduce sediment in the culverts, the combination of substandard culverts and sedimentation can only be resolved with replacement of the culvert with a spanning structure (bridge). The required sediment removal in the culvert barrels and immediately upstream from the culverts also results in significant bank instability in and around the structure.

CYC Access Road Culverts circa 1978 -- wash silted in more than 8 feet

A flood event in January 2005 jeopardized the safety of residents and staff by eliminating emergency vehicle access for evacuation of the CYC facility, creating the potential for flooding of adjacent CYC structures. Flows emanating from the Clover Creek watershed exceeded culvert capacity and overtopped the roadway by three to five feet. Concern for the rising waters resulted in an air evacuation of the residing children and CYC staff with Blackhawk helicopters from Nellis Air Force Base. During this event, significant flooding also occurred further downstream through the community that resulted in damage to homes, roads, businesses, and utilities. Damages were over $856,656 and included the destruction of the City's municipal drinking well.

Caliente Youth Center Entry Road -- November 18, 2004

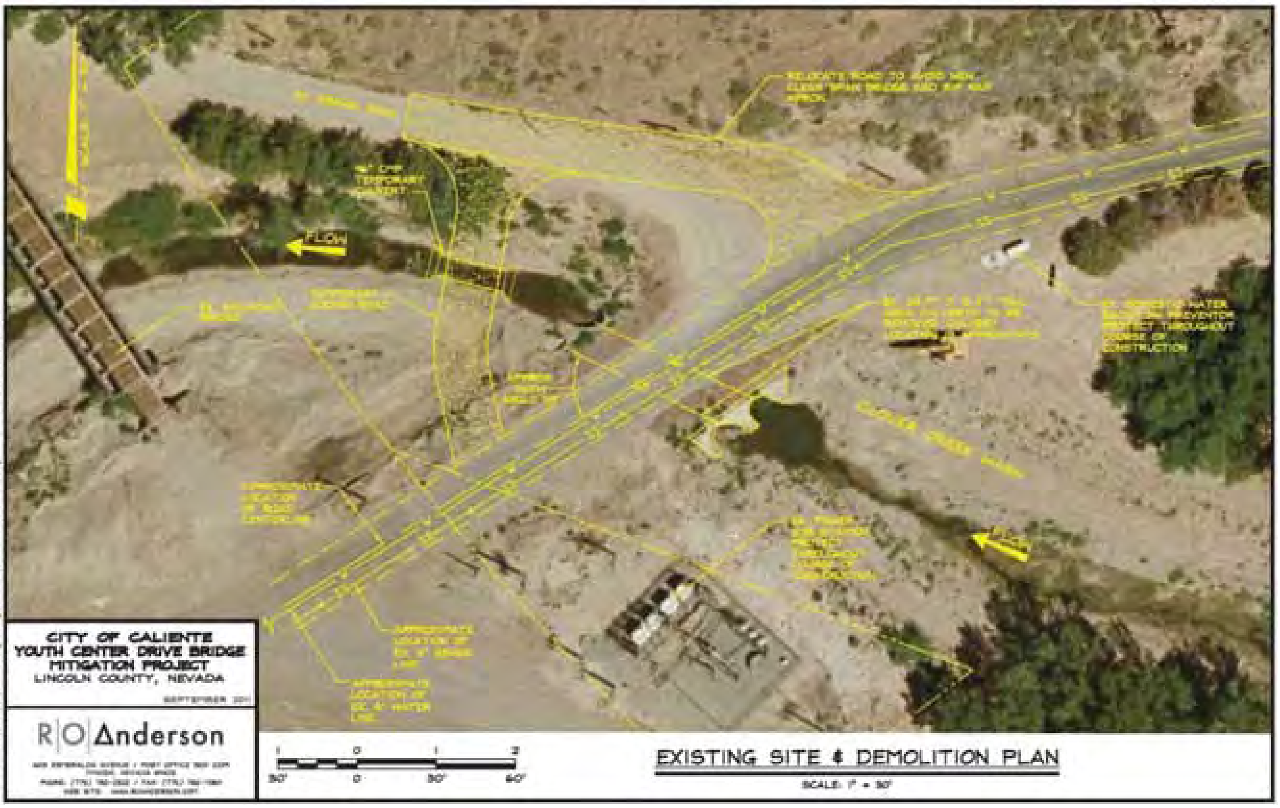
Caliente Youth Center Access Road - 1/10/05



Caliente Youth Center Access Road - 1/11/05

Following the 2005 flood event, the City of Caliente diligently labored to excavate 6 to 8 feet of sedimentation form the culverts. When the December 21, 2010 flood event occurred, City personnel immediately initiated debris removal efforts attempting to retain the conveyance capacity through the inverts to the subject culverts until it was no longer safe to continue these operations. The backwater and debris from this event resulted in severe erosion along the south bank immediately upstream of the culverts threatening the area of the electrical substation that supplies power to the entire community. The bank which was approximately 15 feet from the electrical substation, was eroded down to 3 feet. A declaration of emergency was initiated by the City, the County and State, and private contractors were mobilized to reinforce the rapidly-deteriorating bank with rock reinforcement. Because of the previous maintenance efforts and the City's quick response to debris removal, the substation and access road were saved. Damages for this event totaled $135,830.

Repeated flooding of the access road because of reduced culvert conveyance remains a problem. Because of accumulated sediments, the culverts under the CYC access road now have only 1.5 to 2.0 feet of free opening (out of 12 feet). If this crossing is not removed and replaced with an improved structure, the access road and surrounding improvements remain at risk of flood inundation from relatively frequent hydrologic events. Additionally, critical infrastructure is at risk with the electrical substation being in close proximity to the wash and sewer and water infrastructure being located under the roadway but above the existing culvert. If the access road is damaged during a future flood event, it is likely both the sewer and water infrastructure will be destroyed.



Proposed Project Tasks

The State Public Works Division proposes to remove the existing twelve-foot half-pipe culverts and concrete headwall that are not of sufficient size or configuration to adequately pass flows, sediment and debris from even moderate flooding events. These culverts will be replaced by a spanning structure (bridge) that will be able to convey 100-year event flood flows without overtopping the road. In addition to replacement of the culverts, the project will include relocation of sewer and water infrastructure, as well as bank stabilization both upstream and downstream of the project site, which may include construction of an upstream grade control structure.

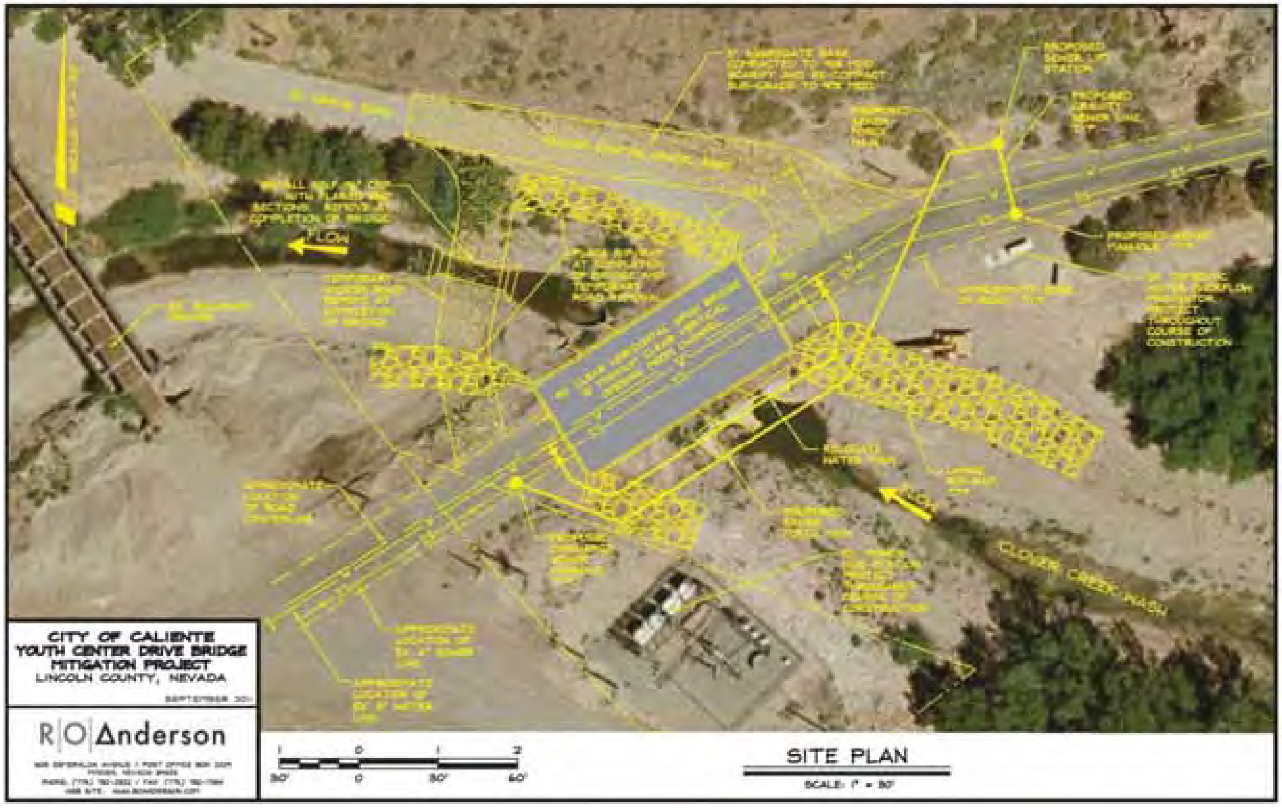
The State Public Works Division will hire an engineering consultant (or retain the current consultant) to accomplish the following:

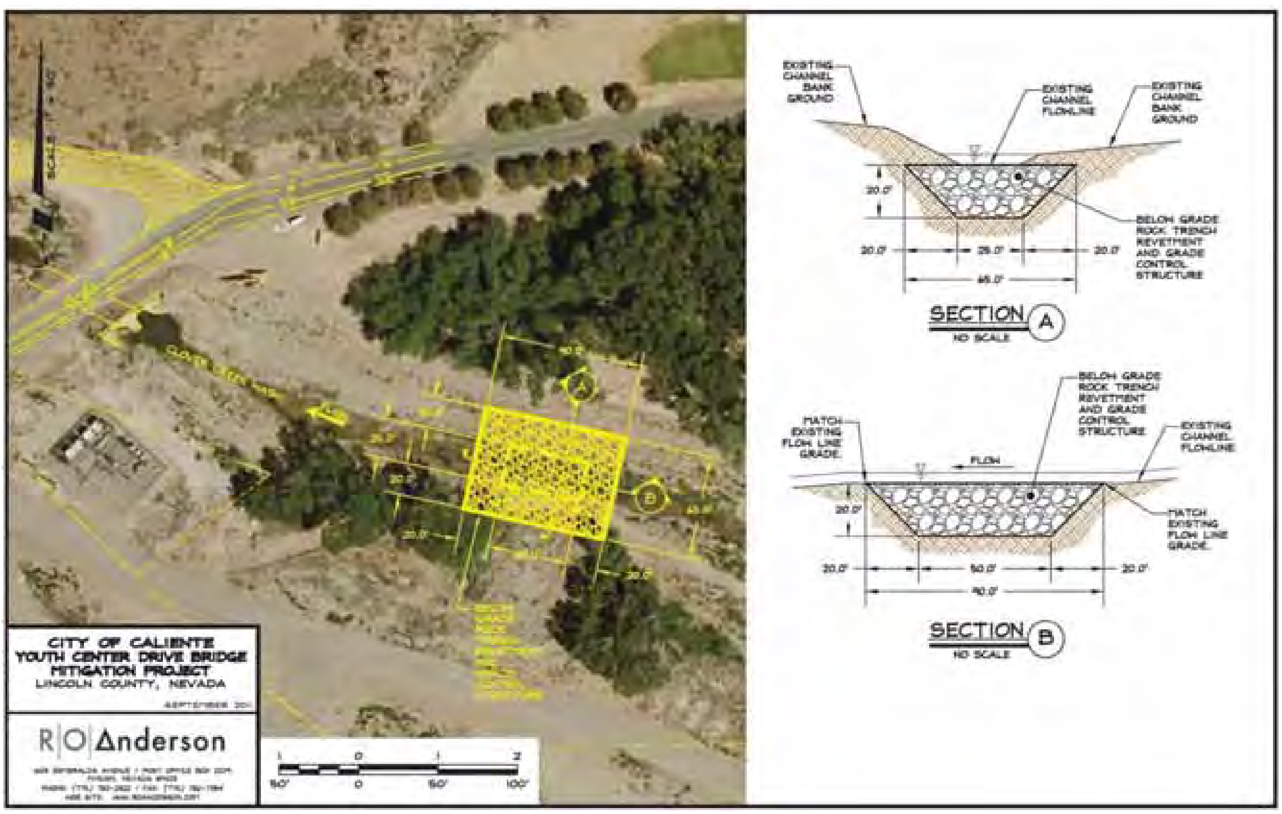
- Conduct preliminary surveys and confirm any necessary easement or right-of-way boundaries.
- Refine hydrologic and hydraulic analyses.
- Prepare final design.
- Prepare data as required for submittal to permitting agencies that may include U.S. Army Corps of Engineers, Bureau of Land Management, Nevada Division of State Lands, Nevada Department of Transportation, Lincoln County, City of Caliente, and Lincoln County Power District #1.
- Produce engineering drawings and specifications.
- Prepare detailed cost estimate.
- Prepare FEMA Conditional Letter of Map Revision (CLOMR) application and supporting documentation since the flood hazard is presently mapped on the FIRM.
- The consultant will prepare the bid package and assist the State Public Works Division with contractor selection. The successful bidder will be determined based on the federal and state procurement requirements and construction contracts will be issued accordingly.

Construction will have the following elements:

- Establish a staging site on Youth Center Drive; install security fencing; and install temporary utilities. Minor cleanup and restoration will be necessary when the staging areas are broken down.
- Clear the debris and sedimentation from existing culverts and adjacent banks.
- Install and maintain traffic control measures to ensure and retain access to CYC during construction. This will be in the form of a temporary low water crossing.
- Excavate two existing culverts and water and sewer infrastructure.
- Replace existing culverts with single-span structure (bridge) concrete culvert. Install concrete wing walls at the upstream entrance to the bridge. Reconstruct the road surface following bridge installation.
- Relocate and install water and sewer infrastructure.
- Install riprap and revegetation for bank stabilization both upstream and downstream. This will include construction of an upstream grade control structure.
- It is anticipated that all of the work will be conducted on State property or within existing rights-of-way.

- Construction inspection will be performed by consultant, State of Nevada, and 3rd party materials testing lab/agency.





After construction is complete, the following will occur:

- Preparation of as-built plans by the consultant.
- When as-built data are available, the State Public Works Division will submit a request for a Letter of Map Revision (LOMR) to FEMA to update the FIRM.

The Caliente Youth Center will assume responsibility for system maintenance once the work is complete. Maintenance includes:

- Removal of debris from culverts on an annual basis, or as needed following major storms.
- Annual inspection of bridge.

Once the facility is constructed the physical structure should require almost no maintenance. However, at this location there is considerable sediment and debris that is deposited annually causing the channel and ultimately the culverts to clog. As a result, it is appropriate to budget for the removal of these materials; it will be particularly important after a major run-off event. The annual maintenance budget is set at $12,000 and includes:

- Excavator with an operator costs about $180 per hour.
- A small (10-wheel) dump truck with driver is about $95 per hour.
- About 40 to 80 hours per year for both pieces of equipment.

Estimated Project Timeline

Phase	Duration	Itemized Action List
Final Design	180 days	1) Solicit and retain consulting engineering and surveying firm for design work. 2) Engineering consultant will conduct preliminary surveys and confirm any necessary easement or right-of-way boundaries, and prepare final design.
Initial Project Permitting	180 days	1) Upon completion of final hydraulic model, Engineering Consultant will prepare the FEMA Conditional Letter of Map Revision (CLOMR) application and supporting documentation. 2) Engineering Consultant will forward final design documents to the following agencies anticipated to be included in the final plans review and permitting process: a) U.S. Army Corps of Engineers b) Bureau of Land Management c) Nevada Division of State Lands d) Nevada Department of Transportation e) Lincoln County f) City of Caliente g) Lincoln County Power District #1
Bid Project for Construction	60 days	1) Once final permitting requirements have been obtained and incorporated into the project's drawings and specifications, and the project cost estimate is complete, the consultant will assist State of Nevada Public Works Division with the bid solicitation process.
Project Construction	120 days	1) The successful contractor will construct the proposed temporary low water crossing, proposed bridge, relocate water and sewer infrastructure, reconstruct the road, install bank protection for the electrical substation and downstream, and any accompanying traffic controls or signage. 2) Contract administration services will be performed by the consultant during this phase including quality control and quality assurance services (QA/QC) and periodic inspections.
Post Construction Permitting Services	120 days	1) Upon completion of construction, the Engineer Consultant will prepare as-built plans, a final hydraulic model based on constructed conditions and prepare the Letter of Map Revision (LOMR) application for submittal to and final approval of FEMA.
Project Close Out	120 days	1) Once completed a project close out letter will be issued.
Total	780 days	

Appendix B: Site Photographs

Appendix B – Site Photographs e

Clover Creek – looking west from Project site.

Clover Creek – looking west toward existing culverts/project site.

Appendix C: Southwestern Willow Flycatcher Protocol

Prepared in cooperation with the Bureau of Reclamation and the U.S. Fish and Wildlife Service

A Natural History Summary and Survey Protocol for the Southwestern Willow Flycatcher

Chapter 10 of
Section A, Biological Science
Book 2, Collection of Environmental Data

Techniques and Methods 2A-10

U.S. Department of the Interior
U.S. Geological Survey

Cover: Southwestern Willow Flycatcher. Photograph taken by Susan Sferra, U.S. Fish and Wildlife Service.

A Natural History Summary and Survey Protocol for the Southwestern Willow Flycatcher

By Mark K. Sogge, U.S. Geological Survey; Darrell Ahlers, Bureau of Reclamation; and Susan J. Sferra, U.S. Fish and Wildlife Service

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U.S. Department of the Interior
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U.S. Department of the Interior
KEN SALAZAR, Secretary

U.S. Geological Survey
Marcia K. McNutt, Director

U.S. Geological Survey, Reston, Virginia: 2010

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Contents

Figures

Conversion Factors

Multiply	By	To obtain
centimeter (cm)	0.3937	inch (in.)
gram (g)	0.03527	ounce, avoirdupois (oz)
hectare (ha)	2.471	acre
kilometer (km)	0.6214	mile (mi)
meter (m)	3.281	foot (ft)
millimeter (mm)	0.03937	inch (in.)

Abbreviations and Acronyms

GPS	Global Positioning System
NDVI	Normalized Difference Vegetation Index
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

A Natural History Summary and Survey Protocol for the Southwestern Willow Flycatcher

By Mark K. Sogge, U.S. Geological Survey; Darrell Ahlers, Bureau of Reclamation; and Susan J. Sferra, U.S. Fish and Wildlife Service

Background

The Southwestern Willow Flycatcher (*Empidonax traillii extimus*) has been the subject of substantial research, monitoring, and management activity since it was listed as an endangered species in 1995. When proposed for listing in 1993, relatively little was known about the flycatcher's natural history, and there were only 30 known breeding sites supporting an estimated 111 territories rangewide (Sogge and others, 2003a). Since that time, thousands of presence/absences surveys have been conducted throughout the historical range of the flycatcher, and many studies of its natural history and ecology have been completed. As a result, the ecology of the flycatcher is much better understood than it was just over a decade ago. In addition, we have learned that the current status of the flycatcher is better than originally thought: as of 2007, the population was estimated at approximately 1,300 territories distributed among approximately 280 breeding sites (Durst and others, 2008a).

Concern about the Southwestern Willow Flycatcher on a rangewide scale was brought to focus by Unitt (1987), who described declines in flycatcher abundance and distribution throughout the Southwest. *E. t. extimus* populations declined during the 20th century, primarily because of habitat loss and modification from activities, such as dam construction and operation, groundwater pumping, water diversions, and flood control. In 1991, the U.S. Fish and Wildlife Service (USFWS) designated the Southwestern Willow Flycatcher as a candidate category 1 species (U.S. Fish and Wildlife Service, 1991). In July 1993, the USFWS proposed to list *E. t. extimus* as an endangered species and to designate critical habitat under the Act (U.S. Fish and Wildlife Service, 1993). A final rule listing *E. t. extimus* as endangered was published in February 1995 (U.S. Fish and Wildlife Service, 1995); critical habitat was designated in 1997 (U.S. Fish and Wildlife Service, 1997). The USFWS Service released a Recovery Plan for the Southwestern Willow Flycatcher in 2002 (U.S. Fish and Wildlife Service, 2002), and re-designated critical habitat in 2005 (U.S. Fish and Wildlife Service, 2005).

In addition to its federal status, the Southwestern Willow Flycatcher is listed as an endangered species or species of concern in Arizona (Arizona Game and Fish Department, 2006), New Mexico (New Mexico Department of Game and Fish, 1996), California (California Department of Fish and Game, 1991), and Utah (Utah Division of Wildlife Resources, 1997).

Sound management and conservation of an endangered species like the Southwestern Willow Flycatcher requires current, detailed information on its abundance and distribution. This requires, among other things, identifying where flycatchers are and are not breeding, and annual monitoring of as many breeding areas as possible. Such efforts require effective, standardized survey protocols and consistent reporting, at both local and regional levels. However, the Willow Flycatcher is a difficult species to identify and survey for. Moreover, inconsistent or ineffective surveys are of limited value, can produce misleading information (including "false positives" and "false negatives"), hinder regional and rangewide analyses, and waste limited resources.

We developed this document to provide a standardized survey protocol and a source of basic ecological and status information on the flycatcher. The first section summarizes the current state of knowledge regarding Southwestern Willow Flycatcher natural history, based on a wide array of published and unpublished literature. Emphasis is given to information relevant to flycatcher conservation and management, and to conducting and interpreting surveys. The second section details a standard survey protocol that provides for consistent data collection, reporting, and interpretation. This protocol document builds on and supersedes previous versions, the most recent of which was Sogge and others (1997a). In this update, we incorporate over a decade of new science and survey results, and refine the survey methodology to clarify key points. Further, we update the standard survey data sheets and provide guidelines on how to fill in the requested information. Amidst these revisions, the basic approach of the survey protocol has remained unchanged—multiple surveys at each survey area within the same breeding season, the use of the call-playback technique using flycatcher vocalizations to increase the probability of detection, and verification of species identity through its diagnostic song.

Section 1. Natural History

Breeding Range and Taxonomy

The Willow Flycatcher is a widespread species that breeds across much of the conterminous United States (Sedgwick, 2000). Four subspecies commonly are recognized in North America, with each occupying a distinct breeding range (fig. 1): *E. t. adastus*, ranging across the northern Rocky Mountains and Great Basin; *E. t. brewsteri*, found west of the Sierra Nevada and Cascade Mountains along the Pacific Slope; *E. t. extimus*, the Southwestern Willow Flycatcher, which breeds across the Southwest; and *E. t. traillii*, ranging east of the northern Rocky Mountains. Although the overall subspecies' ranges are distinct, Sedgwick (2001) and Paxton (2008) noted interbreeding/gradation zones in the boundary area between *E. t. extimus* and *E. t. adastus*.

The breeding range of the Southwestern Willow Flycatcher includes southern California, Arizona, New Mexico, southwestern Colorado, and extreme southern portions of Nevada and Utah: specific range boundaries are delineated in the subspecies' recovery plan (U.S. Fish and Wildlife Service, 2002). Unitt (1987) included western Texas in the subspecies' range, but recent breeding records from western Texas are lacking. Records of probable breeding Southwestern Willow Flycatchers in Mexico are few and restricted to extreme northern Baja California and Sonora (Unitt, 1987; Wilbur, 1987). Although recent data are lacking, the USFWS does include parts of northern Mexico in its description of *E. t. extimus* breeding range (U.S. Fish and Wildlife Service, 2002).

Although they appear very similar to most observers, experienced taxonomist or those using specialized equipment (for example, an electronic colorimeter) can differentiate among the subspecies by subtle differences in color and morphology (for example, Unitt, 1987; Paxton, 2008). Despite the subtle level of differences, the taxonomic status of *E. t. extimus* has been critically reviewed and confirmed multiple times based on morphological, genetic, and song data (Hubbard, 1987; Unitt, 1987; Browning, 1993; Paxton, 2000; Sedgwick, 2001).

The Southwestern Willow Flycatcher was described by Phillips (1948) from a specimen collected along the San Pedro River in southeastern Arizona. The Southwestern Willow Flycatcher generally is paler than other Willow Flycatcher subspecies, although this difference is indistinguishable without considerable experience and training, and study skins as comparative reference material. The southwestern subspecies differs in morphology (primarily wing formula) but not overall size. The plumage and color differences between the Willow Flycatcher subspecies are so subtle that they should not be used to characterize birds observed in the field (Unitt, 1987; Hubbard, 1999; U.S. Fish and Wildlife Service, 2002).

Migration and Winter Range, Habitat, and Ecology

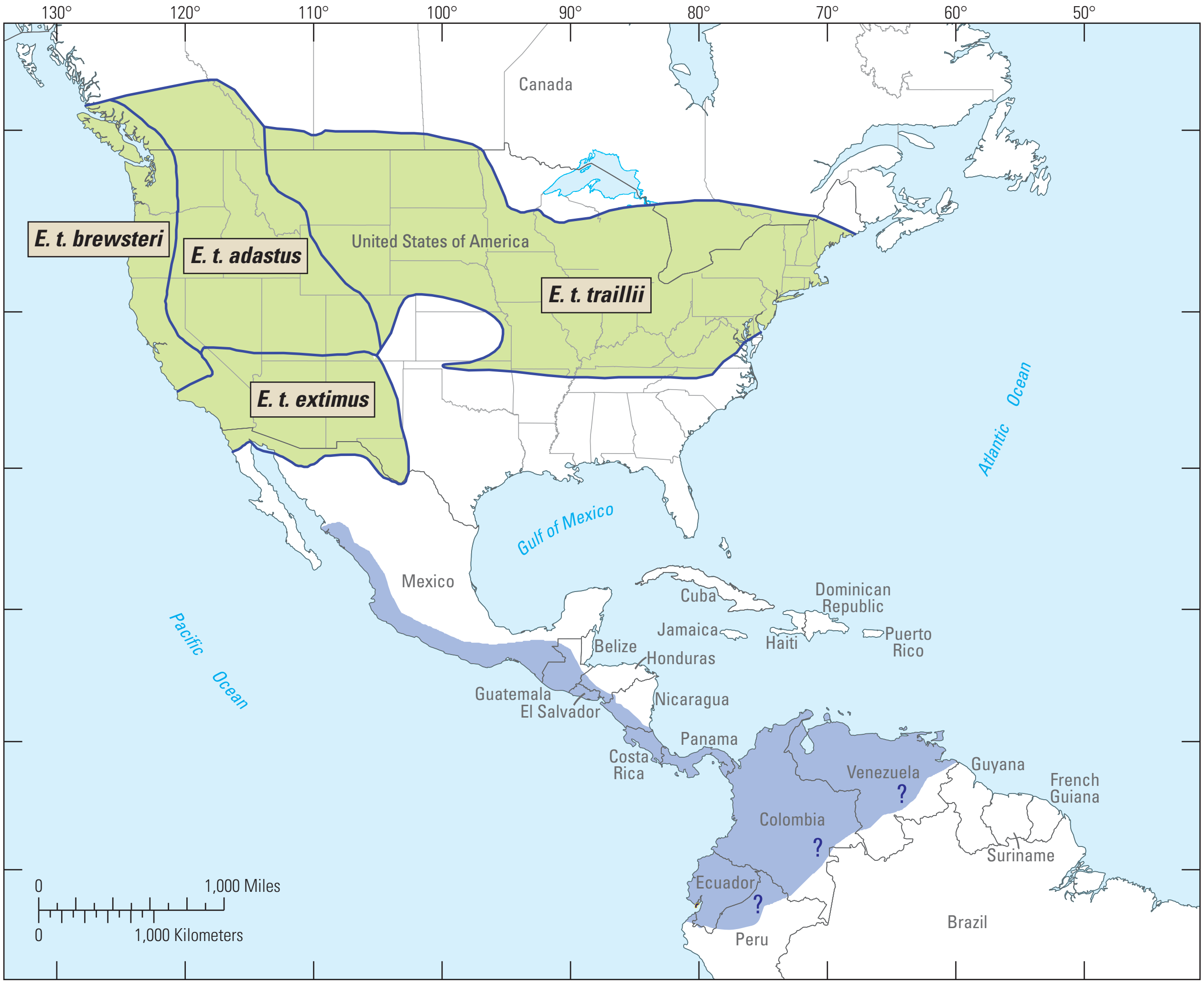
All Willow Flycatcher subspecies breed in North America but winter in the subtropical and tropical regions of southern Mexico, Central America, and northern South America (Sedgwick, 2000; Koronkiewicz, 2002; fig. 1). Most wintering birds are found in the Pacific slope lowlands in Mexico and Central America, and Caribbean slope lowlands in Mexico and Guatemala.

Because all Willow Flycatcher subspecies look very similar, determining specific wintering sites for the southwestern race has been challenging. However, recent genetic analysis of wintering birds (Paxton, 2008) suggests that the four subspecies occupy finite areas of the wintering grounds, but with overlapping ranges. The Southwestern Willow Flycatcher appears to be largely restricted to the center of the winter range (in the vicinity of Costa Rica), although Paxton (2008) suggests more research is needed to address this question.

On the wintering grounds, flycatchers primarily are found in habitats that have four main components: (1) standing or slow moving water and/or saturated soils, (2) patches or stringers of trees, (3) woody shrubs, and (4) open areas (Koronkiewicz and Whitfield, 1999; Koronkiewicz and Sogge, 2000; Lynn and others, 2003; Nishida and Whitfield, 2007; Schuetz and others, 2007). Based on surveys to date, the presence of water or saturated soils is almost universal, although tree heights and configurations, the presence of woody shrubs, and the amount of open space surrounding winter territories can vary considerably (Schuetz and others, 2007).

Male and female flycatchers hold separate, individual non-breeding territories, and defend those territories throughout the winter by using song, calls, and aggression displays. Fidelity to wintering territories and sites is high, as is survivorship over the wintering period (Koronkiewicz and others, 2006b; Sogge and others, 2007).

Willow Flycatchers travel approximately 1,500–8,000 km each way between wintering and breeding areas. During migration, flycatchers use a wider array of forest and shrub habitats than they do for breeding, although riparian vegetation may still be a preferred migration habitat type (Finch and others, 2000). Migration requires high energy expenditures, exposure to predators, and successful foraging in unfamiliar areas. Therefore, migration is the period of highest mortality within the annual cycle of the flycatcher (Paxton and others, 2007). Willow Flycatchers of all subspecies sing during northward migration, perhaps to establish temporary territories for short-term defense of food resources.



Basemap modified from U.S. Geological Survey and other agency digital data, various scales. Projection Mercator, World Geodetic System1984 datum.

EXPLANATION

Approximate range distribution of the Willow Flycatcher (*Empidonax traillii*)—Adapted from Unitt (1987), Browning (1993), and Paxton (2008)

Breeding range, including boundaries of the Willow Flycatcher subspecies

? Wintering range—Question marks reflect uncertainty of the location of the eastern boundary of the winter range

Figure 1. Approximate ranges of the Willow Flycatcher (*Empidonax traillii*) during breeding and non-breeding seasons.

Southwestern Willow Flycatchers typically arrive on breeding grounds between early May and early June (Ellis and others, 2008; Moore and Ahlers, 2009). Because arrival dates vary annually and geographically, northbound migrant Willow Flycatchers of multiple subspecies pass through areas where Southwestern Willow Flycatchers have already begun nesting. Similarly, southbound migrants in late July and August may occur where Southwestern Willow Flycatchers are still breeding (Unitt, 1987). This can make it challenging for an observer to differentiate local breeders from migrants. Other than timing, we still know relatively little about Southwestern Willow Flycatcher migratory behavior, pathways, or habitat use.

Breeding Habitat

Breeding Southwestern Willow Flycatchers are riparian obligates, typically nesting in relatively dense riparian vegetation where surface water is present or soil moisture is high enough to maintain the appropriate vegetation characteristics (Sogge and Marshall, 2000; U.S. Fish and Wildlife Service, 2002; Ahlers and Moore, 2009). However, hydrological conditions in the Southwest can be highly variable within a season and between years, so water availability at a site may range from flooded to dry over the course of a breeding season or from year to year.

The Southwestern Willow Flycatcher breeds in dense riparian habitats across a wide elevational range, from near sea level in California to more than 2,600 m in Arizona and southwestern Colorado (Durst and others, 2008a). Vegetation characteristics of Southwestern Willow Flycatcher breeding habitat generally include dense tree or shrub cover that is ≥ 3 m tall (with or without a higher overstory layer), dense twig structure, and high levels of live green foliage (Allison and others, 2003); many patches with tall canopy vegetation also include dense midstory vegetation in the 2–5 m range. Beyond these generalities, the flycatcher shows adaptability in habitat selection, as demonstrated by variability in dominant plant species (both native and exotic), size and shape of breeding patch, and canopy height and structure (U.S. Fish and Wildlife Service, 2002).

Southwestern Willow Flycatcher breeding habitat can be quantified and characterized in a number of ways, depending on the level of detail needed and habitat traits of interest. For many sites, detailed floristic composition, plant structure, patch size, and even characteristics such as Normalized Difference Vegetation Index (NDVI) have been described in agency reports and scientific journal articles (Allison and others, 2003; Hatten and Paradzick, 2003; Koronkiewicz and others, 2006a; Hatten and Sogge, 2007; Moore, 2007; Schuetz and Whitfield, 2007; Ellis and others, 2008). For purposes of this survey protocol, we take a relatively simple approach and broadly describe and classify breeding sites based on plant species composition and habitat structure. Clearly, these are not the only important components, but they are conspicuous to human perception and easily observed and recorded. Thus, they have proven useful in conceptualizing, selecting and evaluating suitable survey habitat, and in predicting where breeding flycatchers are likely to be found.

Breeding habitat types commonly used by Southwestern Willow Flycatchers are described below. The general categories are based on the composition of the tree/shrub vegetation at the site—native broadleaf, exotic, and mixed native/exotic. In the field, breeding habitats occur along a continuum of plant species composition (from nearly monotypic to mixed species) and vegetation structure (from simple, single stratum patches to complex, multiple strata patches). The images in figures 2–7 illustrate some of the variation in flycatcher breeding habitat, and other examples can be found in numerous publications and agency reports, and on the USGS photo gallery web site (http://sbsc.wr.usgs.gov/SBSCgallery/). The intent of the descriptions and photographs is to provide a general guide for identifying suitable habitat in which to conduct surveys.

Native broadleaf.—Southwestern Willow Flycatchers breed across a great elevational range, and the characteristics of their native broadleaf breeding sites varies between high elevation sites and those at low and mid-elevation sites.

High elevation sites (fig. 2) range from nearly monotypic dense stands of willow to mixed stands of native broadleaf trees and shrubs, 2–7 m in height with no distinct overstory layer; often associated with sedges, rushes, nettles, and other herbaceous wetland plants; usually very dense structure in lower 2 m; live foliage density is high from the ground to the canopy. Vegetation surrounding the patch can range from open meadow, to agricultural lands, to pines or upland shrub.

At low and mid-elevations (fig. 3), flycatcher breeding sites can be composed of single species (often Goodding's willow (*Salix gooddingii*), *S. exigua*, or other willow species) or mixtures of native broadleaf trees and shrubs including (but not limited to) cottonwood, willows, boxelder (*Acer negundo*), ash (*Fraxinus* spp.), alder (*Alnus* spp.), and buttonbush (*Cephalanthus* spp.), height from 3 to 15 m; characterized by trees of different size classes; often a distinct overstory of cottonwood, willow or other broadleaf tree, with recognizable subcanopy layers and a dense understory of mixed species; exotic/introduced species may be a rare component, particularly in the understory.

Monotypic exotic.—(fig. 4) Breeding sites also can include nearly monotypic, dense stands of exotics such as saltcedar (*Tamarix* spp.) or Russian olive (*Elaeagnus angustifolia*), 4–10 m in height forming a nearly continuous, closed canopy (with no distinct overstory layer); lower 2 m commonly very difficult to penetrate due to dense branches, however, live foliage density may be relatively low 1–2 m above ground, but increases higher in the canopy; canopy density uniformly high.

Aerial view of Little Colorado River near Greer, Arizona. Photograph by USGS, 1995.

Parkview Fish Hatchery, New Mexico. Photograph by USGS, 2000.

Tierra Azul, New Mexico. Photograph by USGS, 2005.

Little Colorado River near Greer, Arizona. Photograph courtesy of Arizona Game and Fish Department, 1996.

Rio Grande State Wildlife Area, Colorado. Photograph by USGS, 2002.

McIntyre Springs, Colorado. Photograph by USGS, 2002.

Figure 2. Examples of Southwestern Willow Flycatcher breeding habitat in native broadleaf vegetation at high-elevation sites.

Hassayampa River, Arizona. Photograph by USGS, 2003.

Santa Ynez River, California, Photograph by USGS, 1996.

San Luis Rey River, California. Photograph by USGS, 2005.

Kern River, California. Photograph by USGS, 1995.

Bosque del Apache, Rio Grande, New Mexico. Photograph courtesy of Bureau of Reclamation, 2008.

Kern River, California. Photograph by USGS, 1995.

Figure 3. Examples of Southwestern Willow Flycatcher breeding habitat in native broadleaf vegetation at low and mid-elevation sites.

Aerial view of Topock Marsh, Colorado River, Arizona. Photograph by USGS, 1996.

Topock Marsh, Colorado River, Arizona. Photograph by USGS, 1996.

Rio Grande, New Mexico. Photograph by USGS, 2005.

Figure 4. Examples of Southwestern Willow Flycatcher breeding habitat in exotic vegetation.

Salt River, Arizona. Photograph courtesy of Bureau of Reclamation, 1996.

Orrilla Verde, Rio Grande, New Mexico. Photograph by USGS, 2006.

Aerial view of Salt River, Arizona. Photograph by USGS, 1996.

Mixed native/exotic—(fig. 5) These sites include dense mixtures of native broadleaf trees and shrubs (such as those listed above) mixed with exotic/introduced species, such as saltcedar or Russian olive; exotics are often primarily in the understory, but may be a component of overstory; the native and exotic components may be dispersed throughout the habitat or concentrated as a distinct patch within a larger matrix of habitat; overall, a particular site may be dominated primarily by natives or exotics, or be a more-or-less equal mixture.

Regardless of the plant species composition or height, occupied sites almost always have dense vegetation in the patch interior (fig. 6). These dense patches are often interspersed with small openings, open water, or shorter/sparser vegetation, creating a mosaic that is not uniformly dense.

Gila River, Arizona. Photograph by USGS, 2002.

Roosevelt Lake, Arizona. Photograph by USGS, 1999.

Verde River River, Arizona. Photograph by USGS, 2002.

Virgin River, Utah. Photograph by USGS, 1997.

Figure 5. Examples of Southwestern Willow Flycatcher breeding habitat in mixed native/exotic vegetation.

Gila River, Arizona. Photograph by USGS, 2002.

Kern River, California. Photograph by USGS, 1999.

Rio Grande, New Mexico. Photograph by USGS, 2007.

Salt River, Arizona. Photograph by USGS, 1999.

Rio Grande, New Mexico. Photograph by USGS, 2007.

Rio Grande, New Mexico. Photograph by USGS, 2005.

Figure 6. Examples of dense vegetation structure within breeding habitats of Southwestern Willow Flycatcher.

Riparian patches used by breeding flycatchers vary in size and shape, ranging from a relatively contiguous stand of uniform vegetation to an irregularly shaped mosaic of dense vegetation with open areas. Southwestern Willow Flycatchers have nested in patches as small as 0.8 ha (for example, in the Grand Canyon) and as large as several hundred hectares (for example, at Roosevelt Lake, Ariz., or Elephant Butte Reservoir, New Mex.). They have only rarely been found nesting in isolated, narrow, linear riparian habitats that are less than 10 m wide, although they will use such linear habitats during migration.

Flycatcher territories and nests typically are adjacent to open water, cienegas, marshy seeps, or saturated soil, and within riparian areas rooted in standing water. However, in the Southwest, hydrological conditions at a site can vary remarkably within a season, between years, and among nearby sites (fig. 7). Surface water or saturated soil may only be present early in the breeding season (that is, May and part of June), especially in dry years. Similarly, vegetation at a patch may be immersed in standing water during a wet year, but be hundreds of meters from surface water in dry years (Ahlers and Moore, 2009). This is particularly true of reservoir sites, such as the Kern River at Lake Isabella, Calif., Tonto Creek and Salt River at Roosevelt Lake, and the Rio Grande near Elephant Butte Reservoir. Natural or human-caused river channel modifications and altered subsurface flows (for example, from agricultural runoff), can lead to a total absence of water or visibly saturated soil at a site for several years.

Other potentially important aspects of Southwestern Willow Flycatcher habitat include distribution and isolation of vegetation patches, hydrology, food base (arthropods), parasites, predators, environmental factors (for example temperature, humidity), and interspecific competition (U.S. Fish and Wildlife Service, 2002). Population dynamics

Rio Grande at San Marcial, New Mexico, with dry substrate. Photograph by USGS, 2007.

Rio Grande at San Marcial, New Mexico, with flowing water beneath the territories. Photograph by USGS, 2007.

Tonto Creek inflow to Roosevelt Lake, Arizona, during a dry year. Photograph by USGS, 2004.

Tonto Creek inflow to Roosevelt Lake, Arizona, during high-water year. Photograph by USGS, 2005.

Figure 7. Examples of the variable hydrologic conditions at breeding habitats of Southwestern Willow Flycatcher.

factors, such as demography (for example, survivorship rates, fecundity), distribution of breeding groups across the landscape, flycatcher dispersal patterns, migration routes, the tendency for adults and surviving young to return to their previous year breeding site, and conspecific sociality also influence where flycatchers are found and what habitats they use (U.S. Fish and Wildlife Service, 2002).

It is critically important to recognize that the ultimate measure of habitat suitability is not simply whether or not a site is occupied. Habitat suitability occurs along a gradient from high to poor to unsuitable; the best habitats are those in which flycatcher reproductive success and survivorship result in a stable or growing population. Some occupied habitats may be acting as population sources, while others may be functioning as population sinks (Pulliam, 1988). Therefore, it can take extensive research to determine the quality of any given habitat patch. Furthermore, productivity and survival rates can vary widely among years (Paxton and others, 2007; Ellis and others, 2008; Ahlers and Moore, 2009), so conclusions based on short-term datasets or data extrapolated from one area to another may be erroneous. It also is important to note that not all unoccupied habitat is unsuitable; some sites with suitable habitat may be geographically isolated or newly established, such that they are not yet colonized by breeding flycatchers. There also may simply not be enough flycatchers in a given area to fill all available habitat in particular locations (U.S. Fish and Wildlife Service, 2002). A better understanding of which habitats or sites are sinks or sources can be especially helpful in site conservation and restoration planning.

As described earlier, migrant Willow Flycatchers may occur in riparian habitats that are structurally unsuitable for breeding (for example, too sparse, smaller patch size, etc.), and in non-riparian habitats. Such migration stopover areas, even though not used for breeding, may be critically important resources affecting local and regional flycatcher productivity and survival (U.S. Fish and Wildlife Service, 2002, 2005).

Breeding Chronology and Biology

Unless otherwise noted, the information that follows and upon which the generalized breeding season chronology (fig. 8) is based comes from Unitt (1987), Whitfield (1990), Maynard (1995), Sogge and others (2003b), Paxton and others (2007), Schuetz and Whitfield (2007), and Ellis and others (2008). Extreme or record dates for any stage of the breeding cycle may vary by 1–2 weeks from the dates presented, depending on the geographic area, extreme weather events, yearly variation and other factors. Higher elevation areas, in particular, have delayed chronology (Ahlers and White, 2000).

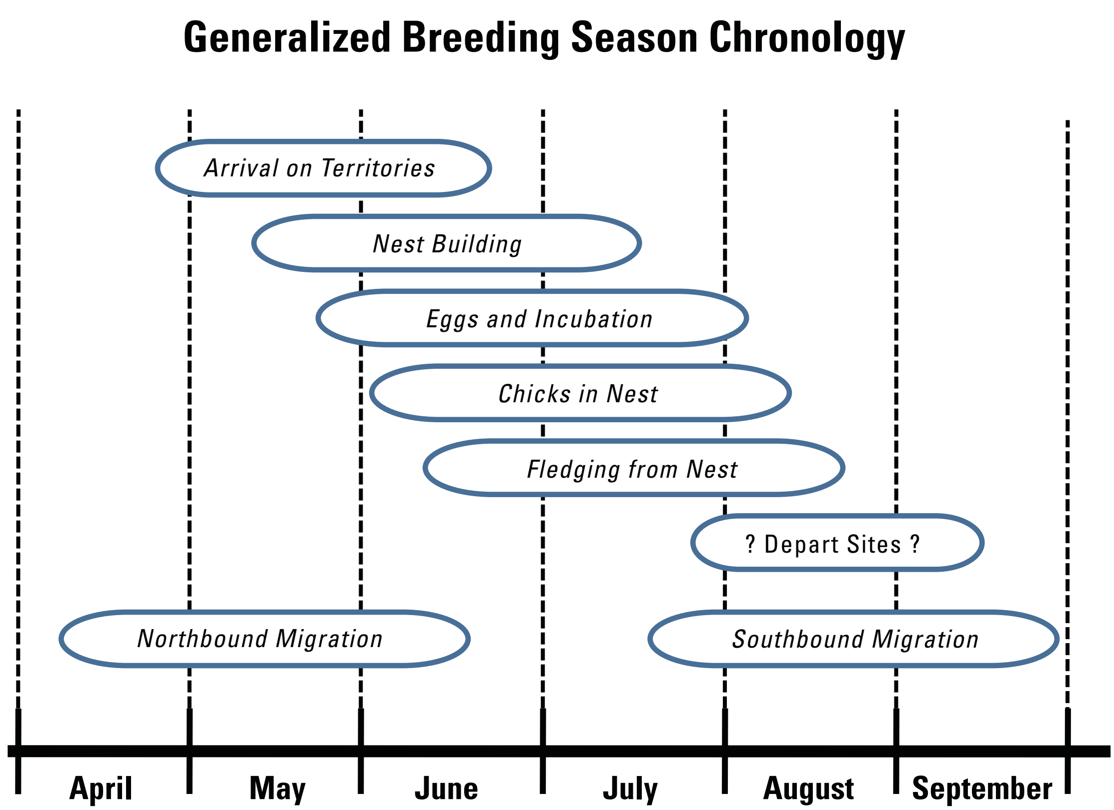


Figure 8. Generalized migration and breeding chronology for the Willow Flycatcher in the Southwest. Extreme or record dates may occur slightly earlier or later than indicated.

Both sexes can breed beginning in their second year. Male Southwestern Willow Flycatchers generally arrive at breeding areas first; older males typically arrive before younger ones. Although females usually arrive a few weeks after males, some older females are present at sites before late-arriving males. Adult flycatchers will sometimes wander extensively through large riparian sites before and after breeding, possibly as a way to evaluate potential breeding habitat (Cardinal and others, 2006).

Males establish and defend their territories through singing and aggressive interactions. Females settle on established territories, and may choose a territory more for its habitat characteristics than for the traits of its territorial male. Territory size tends to be larger when a male first arrives, then gets smaller after a female pairs with the male (Cardinal and others, 2006). Similarly, male song rate is very high early in the season, then declines after pairing (Yard and Brown, 2003). Not all males are successful in attracting mates in a given year, and as a result unpaired territorial males occur at many breeding sites. Unpaired males are usually a small percentage of any local population, but can comprise as much as 15–25 percent of the territories in some populations (Munzer and others, 2005; Ahlers and Moore, 2009).

Although the Willow Flycatcher as a species is considered predominantly monogamous during the breeding season (Sedgwick, 2000), some Southwestern Willow Flycatcher populations have a relatively high degree of polygyny whereby one male can have more than one breeding female in its territory. Polygynous males generally have two females in their territory, but up to four have been recorded (Davidson and Allison, 2003; Pearson and others, 2006). Polygyny rates can vary between sites, and among years at a given site. At some sites, polygynous males have much higher productivity than monogamous males (Paxton and others, 2007).

Nest building within the territory usually begins within a week or two after pair formation. Egg laying begins as early as mid-May, but more often starts in late May to mid-June. Chicks can be present in nests from late May through early August. Young typically fledge from nests from mid-June through mid-August; later fledglings are often products of re-nesting attempts. Breeding adults generally depart from their territories in early to mid-August, but may stay later if they fledged young late in the season. Males that fail to attract or retain mates, and males or pairs that are subject to significant disturbance, such as repeated nest parasitism or predation may leave territories by early July. Fledglings probably leave the breeding areas a week or two after adults, but few details are known.

Southwestern Willow Flycatcher territory size varies widely, probably due to differences in population density, habitat quality (including vegetation density and food availability), and nesting stage. Studies have reported estimated territory sizes ranging from 0.06 to 2.3 ha (Sogge and others, 1995; Whitfield and Enos, 1996; Bureau of Reclamation, 2009). At Roosevelt Lake, Ariz., measurements of home ranges, which include the defended territory and sometimes adjacent use areas, averaged 0.4 ha for actively breeding males; home range can be much larger for pre- and post-breeding males (Paxton and others, 2007). During incubation and nestling phases territory size, or at least the activity centers of pairs, can be very small. Flycatchers may increase their activity area after young are fledged, and use non-riparian habitats adjacent to the breeding area (Cardinal and others, 2006). This variability among sites, individual territories, and over time illustrates the challenge of defining a minimum habitat patch size for breeding flycatchers, or estimating the number of territories based simply on the size of a given breeding site.

At some breeding sites, non-territorial adult “floaters” will be present among the territorial population. Floaters are quieter and less aggressive than territorial adults, and therefore are harder to detect and frequently overlooked. Most floaters are young males, and float for only a single year. At Roosevelt Lake, floaters typically accounted for 3–8 percent of the known adult population, although the rate was much higher in drought years when habitat quality was lower (Paxton and others, 2007). The presence of floaters in a population may indicate that there is not enough high quality habitat to support all potentially territorial individuals present in a given breeding season.

Nests and Eggs

Historically, 75–80 percent of reported Southwestern Willow Flycatcher nests were placed in willows (Phillips, 1948; Phillips and others, 1964; Hubbard, 1987; Unitt, 1987). Southwestern Willow Flycatchers still commonly place their nests in native plants, but will often build nests in exotics, such as saltcedar and Russian olive (Sogge and Marshall, 2000; Stoleson and Finch, 2003; Durst and others, 2008a). In Arizona, most nests are in saltcedar or willows (Paradzick and Woodward, 2003; McLeod and others, 2007). In a unique situation in San Diego County, Calif., the flycatcher nests in coast live oak (*Quercus agrifolia*) along the San Luis Rey River (Haas, 2003), where oak became the dominant plant species adjacent to the river following willow removal in the 1950s. In another unusual situation, flycatchers in the Cliff-Gila Valley in New Mex. nest in tall boxelder (Stoleson and Finch, 2003). Southwestern Willow Flycatcher nests also have been found in buttonbush, black twinberry (*Lonicera involucrata*), Fremont cottonwood (*Populus fremontii*), alder (*Alnus* spp.), blackberry (*Rubus ursinus*), baccharis (*Baccharis* spp.), and stinging nettle (*Urtica* spp.). Overall, flycatcher nest site selection appears to be driven more by plant structure than by species composition.

Southwestern Willow Flycatchers build open cup nests approximately 8 cm high and 8 cm wide (outside dimensions), exclusive of any dangling material at the bottom. Females build the nest with little or no assistance from the males. Nests typically are placed in the fork of a branch with the nest cup supported by several small-diameter vertical stems. Nest height is highly variable and depends on the available plant structure within the territory; nests have been found from 0.6 m to approximately 20 m above ground. In any given habitat type or nest substrate, nests can be placed wherever suitable twig structure and vegetative cover are present.

Egg laying generally begins from mid-May through mid-June, depending on the geographic area and elevation. Willow Flycatcher eggs are buffy or light tan, approximately 18 mm long and 14 mm wide, with brown markings in a wreath at the blunt end. Clutch size is usually three or four eggs for first nests. Only the female develops a brood patch and incubates the eggs. Incubation lasts 12–13 days from the date the last egg is laid, and all eggs typically hatch within 24–48 hours of each other.

Flycatcher chicks are altricial and weigh only about 1–2 g at hatching, but grow rapidly and are ready to leave the nest at 12–15 days of age (Sedgwick, 2000; Paxton and Owen, 2002). The female provides most or all initial care of the young, although the role of the male increases with the age and size of nestlings. After Willow Flycatchers fledge at 12–15 days of age, they stay close to the nest and each other for 3–5 days, and adults continue feeding the fledged young for approximately 2 weeks. Recently fledged birds may repeatedly return to and leave the nest during this period (Spencer and others, 1996). Both male and female adults feed the fledged young, which give frequent, loud "*peep*" calls.

Southwestern Willow Flycatchers readily re-nest following an unsuccessful nesting attempt, although rarely more than once (Ellis and others, 2008). They also will sometimes nest again (double brood) following a successful nesting attempt, although this is more uncommon than re-nesting and varies between sites and years. From 2002 to 2008 at Elephant Butte Reservoir, approximately 13 percent of the pairs produced two successful nests per year (Ahlers and Moore, 2009). The productivity gains from pairs having successful second nests are important drivers of positive population growth (Paxton and others, 2007; Moore and Ahlers, 2009).

Replacement nests are built in the same territory, either in the same plant or at a distance of as much as 20 m from the previous nest. Reuse of old nests is uncommon, but does occur (Yard and Brown, 1999; Darrell Ahlers, Bureau of Reclamation, unpub. data, 2009). Replacement nest building and egg laying can occur (uncommonly) as late as the end of July or early August. Pairs may attempt a third nest if the second fails. However, clutch size, and therefore potential productivity, decreases with each nest attempt (Whitfield and Strong, 1995; Ellis and others, 2008).

Food and Foraging

The breeding season diet of Southwestern Willow Flycatchers is relatively well documented (DeLay and others, 2002; Drost and others, 2003; Durst, 2004; Wiesenborn and Heydon, 2007; Durst and others, 2008b). Breeding flycatchers are exclusively insectivorous, and consume a wide range of prey taxa ranging in size from small leafhoppers (Homoptera) to large dragonflies (Odonata). Major prey taxa include bugs (Hemiptera), bees and wasps (Hymenoptera), flies (Diptera), and leafhoppers; however, diet can vary widely between years and among different habitat types. There is no known differences in diet by sex, but there are differences between adult and nestling diet in the proportions of some arthropod groups. Differences in the composition of arthropods in flycatcher diet have been documented between native and exotic habitats, and between years within particular breeding sites; however, flycatchers appear able to tolerate substantial variation in relative prey abundance, except in extreme situations such as severe droughts (Durst and others, 2008b).

Willow Flycatchers of all subspecies forage primarily by sallying from a perch to perform aerial hawking and gleaning (Sedgwick, 2000; Durst, 2004). Males and females forage with similar maneuvers, although males may forage higher in the tree canopy than females. Foraging frequently takes place at external edges or internal openings within a habitat patch, or at the top of the upper canopy.

Site Fidelity and Survivorship

Based on studies of banded birds, most adult Southwestern Willow Flycatchers that survive from one year to the next will return to the same river drainage, often in proximity to the same breeding site (U.S. Fish and Wildlife Service, 2002; McLeod and others, 2007; Paxton and others, 2007). However, it is common for individual flycatchers to return to different sites within a breeding area, and even to move between breeding areas, from one year to the next. Some of this movement may be related to breeding success and habitat quality. At Roosevelt Lake, those birds that moved to different sites within a breeding area had on average higher productivity in the year following the move than in the year before the move (Paxton and others, 2007). At Roosevelt Lake and on the San Pedro and Gila Rivers, movement out of breeding patches also increased with the relative age of a patch, which may indicate a preference for younger riparian vegetation structure.

In addition to movements within a breeding site, long-distance movements within and between drainages have been observed (Paxton and others, 2007), at distances up to approximately 450 km. Dispersal of first-year flycatchers is more extensive than adult birds, as typical for most bird species.

Survivorship within the breeding season can be very high, averaging 97 percent at Roosevelt Lake (Paxton and others, 2007). Between-year survivorship of adults can be highly variable, but appears to be similar to that of most small passerine birds studied, with estimates generally ranging from approximately 55 to 65 percent (Stoleson and others, 2000; McLeod and others, 2007; Paxton and others, 2007; Schuetz and Whitfield, 2007). Males and females have similar survivorship rates.

Estimated survivorship of young birds (from hatching to the next breeding season) is highly variable, depending in part on how the estimates are generated (Stoleson and others, 2000). Generally reported as between 15 and 40 percent, juvenile survivorship typically is lower than adult survivorship (Whitfield and Strong, 1995; Stoleson and others, 2000; McLeod and others, 2007). Early fledging young have higher survivorship than those that leave the nest later in the season (Whitfield and Strong, 1995; Paxton and others, 2007). Most flycatchers survive for only 1–2 adult years, and mean life expectancy in Arizona was estimated to be 1.9 years following fledging. However, some individuals live much longer. The maximum reported ages of banded Southwestern Willow Flycatchers are 9–11 years (Sedgwick, 2000; Paxton and others, 2007).

Overall, the Southwestern Willow Flycatcher population appears to persist as one or more widely dispersed metapopulations (Busch and others, 2000; U.S. Fish and Wildlife Service, 2002), with movement of individuals, and thus genetic exchange, occurring across the landscape. However, the amount of movement and interchange is lower among sites that are farther apart or more isolated. Some sites serve as population sources while others may be sinks; some sites will be ephemeral over periods of years or decades. Flycatcher movement and dispersal among sites is important for initial site colonization and subsequent recolonization.

There are few general predictors for the persistence of breeding sites. Relatively large populations, such as the Kern River Preserve, San Pedro River, Elephant Butte Reservoir, and the Gila River have persisted for 10 or more years. However, such large sites can be subject to major changes in population numbers, and even potential extirpation, due to changes in local hydrology, site inundation, drought, etc. (Moore, 2005; Paxton and others, 2007). Although some small populations may be ephemeral and last only a few years (Durst and others, 2008a), others have remained occupied for much longer periods (Kus and others, 2003). Breeding populations also may reappear at unoccupied sites following 1–5 year absences. Suitable flycatcher habitat also can develop—and poor quality habitat can improve—relatively quickly in some sites, under favorable hydrological conditions. For example, at Roosevelt Lake and the San Pedro River (AZ), the age of riparian vegetation when first colonized was as young as 3 years (Paxton and others, 2007). In the same study, flycatchers moved back into older habitat patches when nearby younger, occupied habitat was inundated or scoured away.

Overall, the vegetation and flycatcher occupancy of a habitat patch or river drainage are often dynamic; few if any sites remain static over time. The amount of suitable flycatcher habitat can substantially increase or decrease in just a few years, at local and regional scales. Flycatchers can respond quickly to habitat changes, colonizing new sites if available and abandoning others. Therefore, one cannot assume that local, regional, or rangewide flycatcher population numbers will remain stable over time.

Threats to the Flycatcher and Habitat

The greatest historical factor in the decline of the Southwestern Willow Flycatcher is the extensive loss, fragmentation, and modification of riparian breeding habitat (U.S. Fish and Wildlife Service, 2002). Large-scale losses of southwestern wetlands have occurred, particularly the cottonwood-willow riparian habitats historically used by the Southwestern Willow Flycatcher (Unitt, 1987; General Accounting Office, 1988; Dahl, 1990; State of Arizona, 1990). Changes in the riparian plant community have frequently reduced, degraded, and eliminated nesting habitat for the flycatcher, curtailing its distribution and abundance.

Habitat losses and changes have occurred and continue to occur because of urban, recreational, and agricultural development, water diversion and impoundment, channelization, livestock grazing, and replacement of native habitats by introduced plant species (Marshall and Stoleson, 2000; U.S. Fish and Wildlife Service, 2002). Hydrological changes, natural or man-made, can greatly reduce the quality and extent of flycatcher habitat. Although riparian areas are often not considered as fire-prone, several Southwestern Willow Flycatcher breeding sites were destroyed by fire over the past decade (U.S. Fish and Wildlife Service, 2002), and others are at risk to similar catastrophic loss. Fire danger in these riparian systems may be exacerbated by increases in exotic vegetation, such as saltcedar, diversions or reductions of surface water, increased recreational activity, and drawdown of local water tables.

Although the degradation of many river systems and associated riparian habitat is a key cause of their absence, Southwestern Willow Flycatchers do not require free-running rivers or “pristine” riparian habitats. Most of the largest

Southwestern Willow Flycatcher populations in the last decade were found in reservoir drawdown zones, such as at Roosevelt Lake and Elephant Butte Reservoir. Many breeding populations are found on regulated rivers (Graf and others, 2002). In addition, the vegetation at many smaller flycatcher breeding sites is supported by artificial water sources such as irrigation canals, sewage outflow, or agricultural drainages (U.S. Fish and Wildlife Service, 2002). Although rising water levels could be detrimental to breeding flycatchers within a reservoir drawdown zone, reservoir fluctuations can simulate river dynamics with cycles of destruction and establishment of riparian vegetation, depositing rich sediments and flushing salt accumulations in the soil (Paxton and others, 2007). Therefore, managed and manipulated rivers and reservoirs have the potential to play a positive role by providing flycatcher breeding habitat. However, because rivers and reservoirs are not managed solely to create and maintain flycatcher habitat, the persistence of riparian vegetation in these systems—and any flycatchers breeding therein—is not assured.

Although the historic degradation and loss of native riparian negatively affected the Southwestern Willow Flycatcher, this species does not show an inherent preference for native vegetation. Instead, breeding habitat selection is based primarily on vegetation structure, density, size, and other stand characteristics, and presence of water or saturated soils (U.S. Fish and Wildlife Service, 2002). In fact, approximately 25 percent of known territories are found in habitat composed of 50 percent or greater exotic vegetative component—primarily saltcedar (Durst and others, 2008a). Saltcedar also can be an important habitat component in sites dominated by native vegetation (U.S. Fish and Wildlife Service, 2002, 2005). Despite suggestions that flycatchers breeding in saltcedar are suffering negative consequences and that removal of saltcedar is therefore a benefit (DeLoach and others, 2000; Dudley and DeLoach, 2004), there is increasing and substantial evidence that this is not the case. For example, Paxton and others (2007) found that flycatchers did not suffer any detectable negative consequences from breeding in saltcedar. This is consistent with the findings of Owen and others (2005) and Sogge and others (2006). Therefore, the rapid or large-scale loss of saltcedar in occupied flycatcher habitats, without rapid replacement of suitable native vegetation, could result in reduction or degradation of flycatcher habitat (U.S. Fish and Wildlife Service, 2002; Sogge and others, 2008).

In evaluating Southwestern Willow Flycatcher use of either native or exotic habitat, it is important to recognize that throughout the Southwest, there are many saltcedar-dominated and native-dominated habitats in which flycatchers do not breed (U.S. Fish and Wildlife Service, 2002; Sogge and others, 2006). Therefore, the use of any riparian patch—native or exotic—as breeding habitat will be site specific and will depend on the spatial, structural, and ecological characteristics of that particular patch and the potential for flycatchers to colonize and maintain populations within it.

Drought can have substantial negative effects on breeding flycatchers and their breeding habitat by reducing riparian vegetation vigor and density, and reducing prey availability (Durst, 2004; Paxton and others, 2007; Bureau of Reclamation, 2009). For example, the extreme drought of 2002 caused near complete reproductive failure of the large flycatcher population at Roosevelt Lake; among approximately 150 breeding territories, only two nests successfully fledged young in that year (Ellis and others, 2008). If future climate change produces more frequent or more sustained droughts, as predicted by many climate change models (for example, Seager and others, 2007), southwestern riparian habitats could be reduced in extent or quality. This scenario would present a challenge to the long-term sustainability of Southwestern Willow Flycatcher populations.

Brood parasitism by the Brown-headed Cowbird (*Molothrus ater*) was initially considered another significant threat to the Southwestern Willow Flycatcher (Whitfield, 1990; Harris, 1991; U.S. Fish and Wildlife Service, 1993, 1995; Whitfield and Strong, 1995; Sferra and others, 1997). Cowbirds lay their eggs in the nest of other species (the “hosts”), which raise the young cowbirds—often at the expense of reduced survivorship of their own young. Southwestern Willow Flycatchers seldom fledge any flycatcher young from nests that are parasitized by cowbirds (Whitfield and Sogge, 1999). Although parasitism negatively impacts some Southwestern Willow Flycatcher populations, especially at small and isolated breeding sites, it is highly variable and no longer considered among the primary rangewide threats to flycatcher conservation (U.S. Fish and Wildlife Service, 2002). Cowbird abundance, and therefore parasitism, tends to be a function of habitat type and quality, and the availability of suitable hosts, not specific to the flycatcher. Therefore, large-scale cowbirds control may not always be warranted unless certain impact thresholds are met (U.S. Fish and Wildlife Service, 2002; Rothstein and others, 2003; Siegle and Ahlers, 2004).

Section 2. Survey Protocol

The fundamental principles of the methodology described in this version have remained the same since the original Tibbitts and others (1994) and subsequent Sogge and others (1997a) protocols: the use of vocalization play-back, repeated site visits, and confirmation of flycatcher identity via the species-characteristic song. This newest protocol incorporates guidelines of the 2000 USFWS addendum, and includes changes based on our improved understanding of Willow Flycatcher biology and the significance of potential threats, and the availability of new survey technologies.

Several factors work together to make Southwestern Willow Flycatcher surveys challenging. Difficulties include the flycatcher's physical similarities with other species and subspecies; accessing the dense habitat they occupy; time constraints based on their breeding period; and vocalization patterns. Given these challenges, no methodology can assure 100-percent detection rates. However, the survey protocol described herein has proven to be an effective tool for locating flycatchers, and flycatchers generally are detectable when the protocol is carefully followed. Since 1995, hundreds of sites have been surveyed and thousands of flycatchers detected using the two previous versions of the survey protocol.

The Willow Flycatcher is 1 of 10 regularly occurring *Empidonax* flycatchers found in North America, all of which look very much alike. Like all *Empidonax*, Willow Flycatchers are nondescript in appearance, making them difficult to see in dense breeding habitat. Although the Willow Flycatcher has a characteristic *fitz-bew* song that distinguishes it from other birds (including other *Empidonax*), Willow Flycatchers are not equally vocal at all times of the day or during all parts of the breeding season. Because Southwestern Willow Flycatchers are rare and require relatively dense riparian habitat, they may occur only in a small area within a larger riparian system, thus decreasing detectability during general bird surveys. Migrating Willow Flycatchers (of all subspecies) often sing during their migration through the Southwest, and could therefore be confused with local breeders. In addition, Southwestern Willow Flycatchers are in breeding areas for only 3–4 months of the year. Surveys conducted too early or late in the year would fail to find flycatchers even at sites where they breed.

These life history characteristics and demographic factors influence how Southwestern Willow Flycatcher surveys should be conducted and form the basis upon which this protocol was developed. This protocol is based on the use of repeated call-playback surveys during pre-determined periods of the breeding season, to confirm presence or to derive a high degree of confidence regarding their absence at a site. Such species-specific survey techniques are necessary to collect reliable presence/absence information for rare species (Bibby and others, 1992).

The primary objective of this protocol is to provide a standardized survey technique to detect Southwestern Willow Flycatchers, determine breeding status, and facilitate consistent and standardized data reporting. The survey technique will, at a minimum, help determine presence or absence of the species in the surveyed habitat for that breeding season. Ultimately, the quality of the survey that is conducted will depend on the preparation, training, and in-the-field diligence of the individual surveyor.

This protocol is designed for use by persons who are non-specialists with *Empidonax* flycatchers or who are not expert birders. However, surveyors must have sufficient knowledge, training, and experience with bird identification and surveys to distinguish the Willow Flycatcher from other non-*Empidonax* species, and be able to recognize the Willow Flycatcher's primary song. A surveyor's dedication and attitude, willingness to work early hours in dense, rugged and wet habitats, and their ability to remain alert and aware of important cues also are important. Surveys conducted improperly or by unqualified, inexperienced, or complacent personnel may lead to inaccurate results and unwarranted conclusions.

Surveys conducted by qualified personnel in a consistent and standardized manner will enable continued monitoring of general population trends at and between sites, and between years. Annual or periodic surveys in cooperation with State and Federal agencies should aid resource managers in gathering basic information on flycatcher status and distribution at various spatial scales. Identifying occupied and unoccupied sites will assist resource managers in assessing potential impacts of proposed projects, avoiding impacts to occupied habitat, identifying suitable habitat characteristics, developing effective restoration management plans, and assessing species recovery.

The earlier versions of this protocol (Tibbitts and others, 1994; Sogge and others, 1997a) were used extensively and successfully for many years. Hundreds of flycatcher surveys conducted throughout the Southwest since 1994 revealed much about the usefulness and application of this survey technique. Three important lessons were: (1) the call-playback technique works and detects flycatchers that would have otherwise been overlooked; (2) multiple surveys at each site are important; and (3) with appropriate effort, general biologists without extensive experience with *Empidonax* can find and verify Willow Flycatcher breeding sites.

This revised protocol is still based on call-playback techniques and detection of singing individuals. However, it includes changes in the timing and number of surveys to increase the probability of detecting flycatchers and to help determine if they are breeders or migrants. It also incorporates the basic premise of the USFWS 2000 addendum to the 1997 protocol by requiring a <u>minimum</u> of five surveys in all "project-related" sites. A detailed description of surveys and timing is discussed in section, "Timing and Number of Visits." Changes in the survey data sheets make them easier to use and submit, and allow reporting all site visits within a single year on one form. The new survey forms also are formatted such that the data on the respective forms can be easily incorporated into the flycatcher range-wide database.

This protocol is intended to determine if a habitat patch contains territorial Southwestern Willow Flycatchers, and is not designed establish the exact distribution and abundance of flycatchers at a site. Determining precise flycatcher numbers and locations requires many more visits and additional time observing the behavior of individual birds. This survey protocol also does not address issues and techniques associated with nest monitoring or other flycatcher research activities. Those efforts are beyond the scope usually needed for most survey purposes, and require advanced levels of experience and skills to gather useful data and avoid potential negative effects to the flycatcher. If nest monitoring is a required component of your study, refer to Rourke and others (1999) for appropriate nest monitoring techniques (available for download at http://sbsc.wr.usgs.gov/cprs/research/projects/swwf/reports.asp).

Biologists who are not expert birders or specialists with regard to *Empidonax* flycatchers can effectively use this protocol. However, users should attend a U.S. Fish and Wildlife Service-approved Southwestern Willow Flycatcher survey training workshop, and have knowledge and experience with bird identification, surveys, and ecology sufficient to effectively apply this protocol.

Permits

Federal endangered species recovery permits are required for surveys in all USFWS regions where the Southwestern Willow Flycatcher breeds (application forms can be downloaded at http://www.fws.gov/forms/3-200-55.pdf). State permits also may be required before you can survey within any of the States throughout the Southwestern Willow Flycatcher's range: be certain to check with the appropriate State wildlife agency in your area. It usually takes several months to receive permits, so apply early to avoid delays in starting your surveys. You also must obtain permission from government agencies and private landowners prior to conducting any surveys on their lands.

Pre-Survey Preparation

The degree of effort invested in pre-survey preparation will have a direct effect on the quality and efficiency of the surveys conducted. Pre-survey preparation is often overlooked, but can prove to be one of the more important aspects in achieving high-quality survey results.

Surveyors should study calls, songs, drawings, photographs, and videos of Willow Flycatchers. Several web sites describe life history requirements, and provide photographs and vocalizations. It is especially critical for surveyors to be familiar with Willow Flycatcher vocalizations before going in the field. Although the *fitz-bew* song is the basis of verifying detections using this protocol, Willow Flycatchers use many other vocalizations that are valuable in locating birds and breeding sites. We strongly encourage that all surveyors learn as many vocalizations as possible and refer to the on-line "Willow Flycatcher Vocalizations; a Guide for Surveyors" (available at http://sbsc.wr.usgs.gov/cprs/research/projects/swwf/wiflvocl.asp). Several commercial bird song recordings include Willow Flycatcher vocalizations, but these recordings typically have only a few vocalizations and the dialects may differ from those heard in the Southwest.

If possible, visit known Willow Flycatcher breeding sites to become familiar with flycatcher appearance, behavior, vocalizations, and habitat. Such visits are usually part of the standardized flycatcher survey workshops. All visits should be coordinated with USFWS, State wildlife agencies, and the property manager/owner, and must avoid disturbance to territorial flycatchers. While visiting these sites, carefully observe the habitat characteristics to develop a mental image of the key features of suitable habitat.

Surveyors must be able to identify, by sight and vocalizations, other species likely to be found in survey areas that may be confused with Southwestern Willow Flycatchers. These include Bell's Vireo (*Vireo bellii*), Western Wood-pewee (*Contopus sordidulus*), young or female Vermillion Flycatchers (*Pyrocephalus rubinus*), and other *Empidonax* flycatchers. At a distance, partial song or call notes of Bell's Vireo, Ash-throated Flycatchers (*Myiarchus cinerascens*) and some swallows can sound considerably like a *fitz-bew*. Surveyors also should be able to identify Brown-headed Cowbirds by sight and vocalizations. It is worthwhile to make one or more pre-survey trips to the survey sites or other similar areas to become familiar with the local bird fauna. You might consider obtaining a species list relative to your area and become familiar with those species by site and sound.

Prior to conducting any presence/absence surveys in your respective State or USFWS Region, contact the respective flycatcher coordinators to discuss the proposed survey sites and determine if the sites have been surveyed in prior years. If possible, obtain copies of previous survey forms and maintain consistency with naming conventions and site boundaries. Study the forms to determine if flycatchers have been previously detected in the site, record locations of any previous detections, and read the comments provided by prior surveyors. While surveying, be sure to pay special attention to any patches where flycatchers have previously been detected.

Familiarity with the survey site prior to the first surveys is the best way to be prepared for the conditions you will experience. Determine the best access routes to your sites and always have a back-up plan available in the event of unforeseen conditions (for example, locked gates, weather, etc.). Know the local property boundaries and where the potential hazards may be, including deep water, barbed wire fencing, and difficult terrain. Be prepared to work hard and remain focused and diligent in a wide range of physically demanding conditions. At many sites, these include heat, cold, wading through flowing or stagnant water, muddy or swampy conditions, crawling through dense thickets (often on hands and knees), and exposure to snakes, skunks, and biting insects.

It is imperative that all surveyors exercise the adage "safety first." Be aware of safety hazards and how to avoid them, and do not allow the need to conduct surveys to supersede common sense and safety. Inform your coworkers where you will be surveying and when you anticipate returning. Always take plenty of water and know how to effectively use your equipment, especially compass, Global Positioning System (GPS), and maps.

Equipment

The following equipment is necessary to conduct the surveys:

1. **USGS topographic maps of the area**: A marked copy is required to be attached to survey data sheets submitted at the end of the season. Be sure to always delineate the survey area and clearly mark any flycatcher detections. If the survey area differed between visits; delineate each survey individually.
2. **Standardized survey form**: Always bring more copies than you think you need.
3. **Lightweight audio player**: Be sure the player has adequate volume to carry well; use portable speakers if necessary. Several digital devices, such as CD players and MP3 players, are currently available and can be connected to external amplified speakers for broadcasting the flycatcher vocalizations. However, not all are equally functional or effective in field conditions; durability, reliability, and ease of use are particularly important. Talk to experienced surveyors for recommendations on particular models and useful features.
4. **Extra player and batteries**: In the field, dirt, water, dust, and heat often cause equipment failure, and having backup equipment helps avoid aborting a survey due to equipment loss or failure.
5. **Clipboard and permanent (waterproof) ink pen**: We recommend recording survey results directly on the survey data form, to assure that you collect and record all required data and any field notes of interest.
6. **Aerial photographs**: Aerial photographs can significantly improve your surveys by allowing you to accurately target your efforts, thus saving time and energy in the field. Previously, aerial images were often expensive and difficult to obtain. However, it is now easy to get free or low-cost images from sources, such as Google© Earth. Even moderate resolution images generally are better than none. For higher resolution aerial photographs, check with local planning offices and/or State/Federal land-management agencies for availability. Take color photocopies, not the original aerial photographs, with you in the field. Aerial photographs also are very useful when submitting your survey results but cannot be substituted in lieu of the required topographic map.
7. **Binoculars and bird field guide**: Although this protocol relies primarily on song detections to verify flycatcher presence, good quality binoculars are still a crucial field tool to help distinguish between possible Southwestern Willow Flycatchers and other species. Use a pair with 7–10 power magnification that can provide crisp images in poor lighting conditions. A good field guide also is essential for the same reason.
8. **GPS unit**: A GPS unit is needed for determining survey coordinates and verifying the location of survey plots on topographic maps. All flycatcher detections should be stored as waypoints and coordinates recorded on the survey form. A wide variety of fairly inexpensive GPS units are currently available. Most commercially available units will provide accuracy within 10 m, which is sufficient for navigating and marking locations.
9. **Compass**: Surveyors should carry a compass to help them while navigating larger habitat patches. This is an important safety back-up device, because GPS units can fail or lose power. Most GPS units have a feature to provide an accurate bearing to stored waypoints (for example, previous flycatcher detections, your parked vehicle, etc.); however, many units do not accurately display the direction in which the surveyor is traveling slowly through dense vegetation. A compass set to the proper bearing provides a more reliable method to navigate the survey site and relocate previously marked locations.

The following equipment also is recommended:

10. **Camera:** These are very helpful for habitat photographs, especially at sites where flycatchers are found. Small digital cameras are easily portable and relatively inexpensive.
11. **Survey flagging:** Used for marking survey sites or areas where flycatcher are detected. Check with the local land owner or management agency before flagging sites. Use flagging conservatively so as to not attract people or predators.
12. **Field vest:** A multi-pocket field vest can be very useful for carrying field equipment and personal items. We recommend muted earth-tone colors.

13. **Cell phone and/or portable radio**: In addition to providing an increased level of safety, cell phones or portable radios may be used by surveyors to assist each other in identifying territories and pairs in dense habitats, or where birds are difficult to hear.

In addition to the necessary equipment mentioned above, personal items, such as food, extra water or electrolyte drink, sunscreen, insect repellent, mosquito net, first-aid kit, whistle, and a light jacket, also should be considered. Being prepared for unforeseen difficulties, and remaining as comfortable as conditions allow while surveying are important factors to conducting thorough and effective surveys.

All survey results (both negative and positive) should be recorded directly on data forms when possible. These data forms have been designed to prompt surveyors to record key information that is crucial to interpretation of survey results and characterization of study sites. Even if no flycatchers are detected or habitat appears unsuitable, this is valuable information and should be recorded. Knowing where flycatchers are not breeding can be as important as knowing where they are; therefore, negative data are important. Standardized data forms are provided in appendix 1, or can be downloaded online. Always check for updated forms prior to each year's surveys.

Willow Flycatcher surveys are targeted at this species and require a great deal of focused effort. Surveyors must be constantly alert and concentrate on detecting a variety of flycatcher cues and responses. Therefore, field work, such as generalized bird surveys (for example, point counts or walking transects) or other distracting tasks, should not be conducted in conjunction with Willow Flycatcher surveys. Avoid bringing pets or additional people who are not needed for the survey. Dress in muted earth-tone colors, and avoid wearing bright clothing.

Willow Flycatcher Identification

The Southwestern Willow Flycatcher is a small bird, approximately 15 cm long and weighing about 11–12 g. Sexes look alike and cannot be distinguished by plumage. The upper parts are brownish-olive; a white throat contrasts with the pale olive breast, and the belly is pale yellow. Two white wing bars are visible (juveniles have buffy wing bars) and the eye ring is faint or absent. The upper mandible is dark and the lower mandible light. The tail is not strongly forked. When perched, the Willow Flycatcher often flicks its tail upward. As a group, the *Empidonax* flycatchers are very difficult to distinguish from one another by appearance. The Willow Flycatcher also looks very similar to several other passerine species you may encounter in the field.

Given that Willow Flycatchers look similar to other *Empidonax* flycatchers that may be present at survey sites, the most certain way to verify Willow Flycatchers in the field is by their vocalization. For the purpose of this protocol, identification of Willow Flycatchers cannot be made by sight alone; vocalizations are a critical identification criterion, and specifically the primary song *fitz-bew*. Willow Flycatchers have a variety of vocalizations (see Stein, 1963; Sedgwick, 2000), but two are most commonly heard during surveys or in response to call-playback:

1. ***Fitz-bew***. This is the Willow Flycatcher's characteristic primary song. Note that *fitz-bews* are not unique to the southwestern subspecies; all Willow Flycatchers sing this characteristics song. Male Willow Flycatchers may sing almost continuously for hours, with song rates as high as one song every few seconds. Song volume, pitch, and frequency may change as the season progresses. During prolonged singing bouts, *fitz-bews* are often separated by short *britt* notes. *Fitz-bews* are most often given by a male, but studies have shown female Willow Flycatchers also sing, sometimes quite loudly and persistently (although generally less than males). Flycatchers often sing from the top of vegetation, but also will vocalize while perched or moving about in dense vegetation.

2. ***Whitt***. This is a call often used by nesting pairs on their territory, and commonly is heard even during periods when the flycatchers are not singing (*fitz-bewing*). The *whitt* call appears to be a contact call between sexes, as well as an alarm call, particularly when responding to disturbance near the nest. *Whitt* calls can be extremely useful for locating Willow Flycatchers later in the season when *fitz-bewing* may be infrequent, but are easily overlooked by inexperienced surveyors. When flycatcher pairs have active nests and particularly once young have hatched, *whitts* may be the most noticeable vocalization. However, many species of birds *whitt*, and a *whitt* is not a diagnostic characteristic for Willow Flycatchers. For example, the "*whitt*" of the Black-headed Grosbeak (*Pheucticus melanocephalus*) and Yellow-breasted Chat (*Icteria virens*) are often confused with that of the flycatcher.

The *fitz-bew* and *whitt* calls are the primary vocalizations used to locate Willow Flycatchers. However, other less common Willow Flycatcher vocalizations can be very useful in alerting surveyors to the presence of flycatchers. These include twittering vocalizations typically given during interactions between flycatchers and sometimes between flycatchers and other birds, bill snapping, *britt*'s, and *wheeo*'s. Because these sounds can be valuable in locating territories (Shook and others, 2003), they should be studied prior to going in the field. Willow Flycatcher vocalization recordings are available from Federal and State agency contacts and online at http://sbsc.wr.usgs.gov/cprs/research/projects/swwf/. Standardized recordings of Southwestern Willow Flycatchers also are available online at http://www.naturesongs.com/tyrrcert.html#tyrr. Specifically, only *fitz-bews* and *britts* should be used for conducting surveys, to provide more robust comparative results among sites and years.

Willow Flycatcher song rates are highest early in the breeding season (late May–early June), and typically decline after eggs hatch. However, in areas with many territorial flycatchers or where an unpaired flycatcher is still trying to attract a mate, or where re-nesting occurs, singing rates may remain high well into July. Isolated pairs can be much quieter and harder to detect than pairs with adjacent territorial flycatchers. At some sites, pre-dawn singing (0330–0500 hours) appears to continue strongly at least through mid-July (Sogge and others, 1995). Singing rates may increase again later in the season, possibly coinciding with re-nesting attempts (Yard and Brown, 2003). The social dynamics of adjacent territories can strongly influence vocalization rates. A single "*fitz-bew*" from one flycatcher may elicit multiple responses from adjacent territories. When these interactions occur, it is a good opportunity to distinguish among territories and provides the surveyor with an estimate of territory numbers in the immediate area.

There are some periods during which Willow Flycatchers do not sing and even the use of call-playback sometimes fails to elicit any response. This can be particularly true late in the breeding season. Early and repeated surveys are the best way to maximize the odds of detecting a singing flycatcher and determining its breeding status.

Timing and Number of Visits

No survey protocol can guarantee that a Southwestern Willow Flycatcher, if present, will be detected on any single visit. However, performing repeated surveys during the early to mid-nesting season increases the likelihood of detecting flycatchers and aids in determining their breeding status. A single survey, or surveys conducted too early or late in the breeding cycle, do not provide definitive data and are of limited value.

For purposes of this survey protocol, we have divided the Southwestern Willow Flycatcher breeding season into three basic survey periods, and specified a minimum number of survey visits for each period (fig. 9). Although the Sogge and others (1997a) protocol recommended a minimum of one survey in each period, we now recommend a differing number of visits for general surveys versus project-related studies.

General surveys are conducted for the sole purpose of determining whether Willow Flycatchers are present or absent from a respective site, when there is no foreseeable direct or indirect impact to their habitat from a known potential project or change in site management. In such cases, a minimum of one survey visit is required in each of the three survey periods.

Project-related surveys are conducted to determine the presence or absence of Willow Flycatchers within a site when there is a potential or foreseeable impact to their habitat due to a potential project or change in site management. Additional surveys are required for project-related studies in order to derive a greater degree of confidence regarding the presence or absence of Willow Flycatchers.

All successive surveys must be at least 5 days apart; surveys conducted more closely are not considered to be separate surveys. Although a minimum of three or five surveys are required for general and project-related purposes, respectively, if the habitat patches are large, contiguous and extremely dense, additional surveys are strongly encouraged to ensure full coverage of the site.

If you are uncertain whether three general surveys or five project-related surveys are required for your respective study, contact your USFWS flycatcher coordinator. As noted earlier, this survey protocol will help determine if territorial flycatchers are present and their approximate locations; if your project requires fine-scale estimates of flycatcher numbers or distribution at a site, you may need to conduct more intensive efforts that include additional surveys, nest searches, and nest monitoring.

Survey Period 1: May 15–31.—For both general and project-related surveys: a minimum of one survey is required. The timing of this survey is intended to coincide with the period of high singing rates in newly arrived males, which tends to begin in early to mid-May. This is one of the most reliable times to detect flycatchers that have established their territories, so there is substantial value to conducting period 1 surveys even though not all territorial males may yet have arrived. Migrant Willow Flycatchers of multiple subspecies will likely be present and singing during this period. Because both migrant and resident Willow Flycatchers are present during this period, and relatively more abundant then in subsequent surveys, it is an excellent opportunity to hone your survey and detection skills and gain confidence in your abilities. Detections of flycatchers during period 1 also provide insight on areas to pay particular attention to during the next survey period.

Survey Period 2: June 1–24.—For general surveys: a minimum of one survey is required. For project-related surveys, a minimum of two surveys are required. Note that this differs from the minimum of one survey that was recommended in this period under the previous protocol (Sogge and others, 1997a). During this period, the earliest arriving males may already be paired and singing less, but later arriving males should still be singing strongly. Period 2 surveys can provide insight about the status of any flycatchers detected during survey period 1. For example, if a flycatcher is detected during survey period 1 but not survey period 2, the first detection may have been a migrant. Conversely, detecting a flycatcher at the same site during periods 1 and 2 increases the likelihood that the bird is not a migrant, although it does not necessarily confirm it. Survey period 2 also is the earliest time during which you are likely to find nesting activity by resident birds at most sites. Special care should be taken during this period to watch for activity that will verify whether the flycatchers that are present are attempting to breed. A little extra time and diligence should be spent at all locations where flycatchers were detected during survey period 1.

Survey Visit Timing, Numbers, and Detection Interpretation

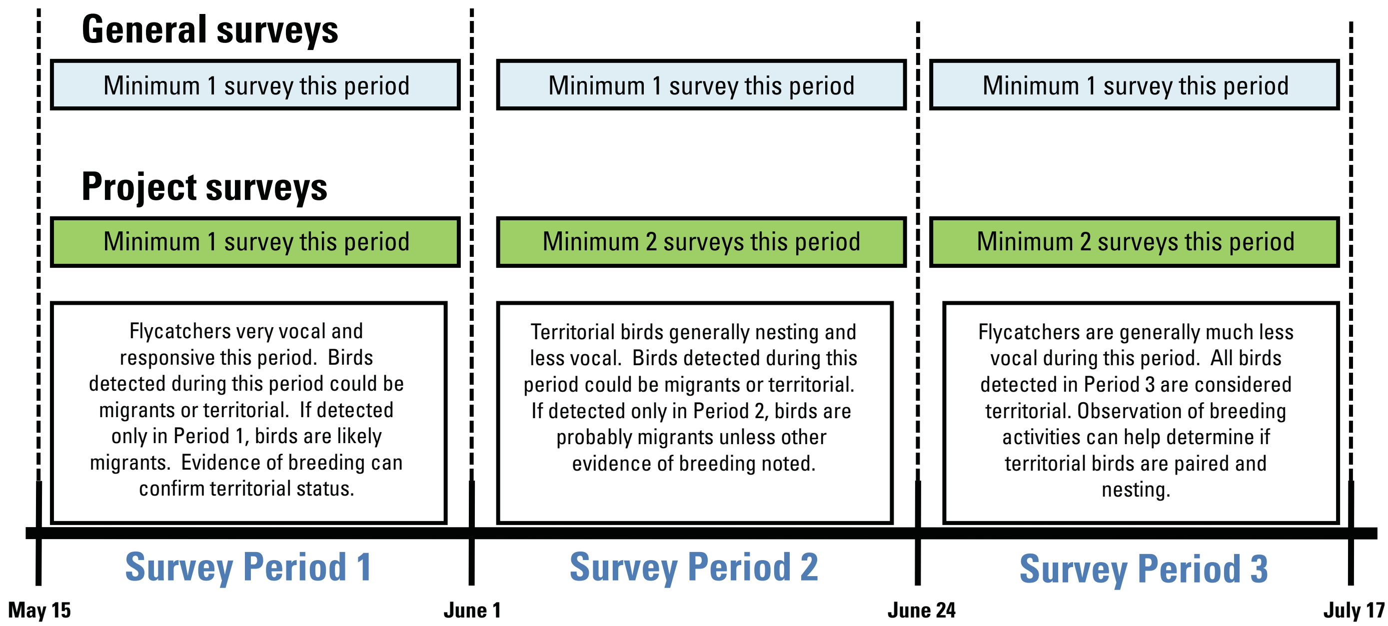


Figure 9. Recommended numbers and timing of visits during each survey period for general surveys and project surveys. General surveys are those conducted when there is no foreseeable direct or indirect impact to their habitat from a known potential project or change in site management. Project-related surveys are conducted when there is a potential or foreseeable impact to their habitat due to a potential project or change in site management.

Survey Period 3: June 25–July 17.—For general surveys, a minimum of one survey is required. For project-related surveys, a minimum of two surveys are required. Virtually all Southwestern Willow Flycatchers should have arrived on their territories by this time. Flycatcher singing rates probably have lessened, and most paired flycatchers will have initiated or even completed their first round of nesting activity. Migrant Willow Flycatchers should no longer be passing through the Southwest; therefore, any flycatchers that you detect are likely to be either territorial or nonbreeding floaters. Surveyors should determine if flycatchers detected during surveys in periods 1 or 2 are still present, and watch closely for nesting activity. Flycatchers that have completed a first nesting attempt may resume vigorous singing during this period. Extra time and diligence should be spent at all locations where flycatchers were detected during survey periods 1 or 2.

At high elevation sites (above 2,000 m), Southwestern Willow Flycatcher arrival and initiation of breeding activities may occur in early June, and possibly later in some years due to weather or migration patterns. Therefore, flycatcher breeding chronology may be delayed by 1 or 2 weeks at such sites, and surveys should be conducted in the latter part of each period.

It may not require multiple surveys to verify Southwestern Willow Flycatcher presence or breeding status. If, for example, Willow Flycatchers are observed carrying nest material during survey periods 1 or 2, this is conclusive verification they are breeders as opposed to migrants, regardless of what is found during period 3. However, it requires a minimum of three surveys for general studies and five surveys for project-related studies to determine with relative confidence that Southwestern Willow Flycatchers probably are not breeding at a site in that year, based on lack of detections.

We strongly encourage additional follow-up surveys to sites where territorial Southwestern Willow Flycatchers are verified or suspected. Extra surveys provide greater confidence about presence or absence of flycatchers at a site, as well as help in estimating the number of breeding territories or pairs, and determining breeding status and the outcome of breeding efforts. Pre-survey visits the evening before the survey or post-survey follow-up later in the morning can help confirm breeding status when surveyors are not under time constraints. However, avoid returning to a site so often as to damage the habitat, establish or enlarge trails, or cause undue disturbance to the flycatchers.

Survey Methods

The survey methods described below fulfill the primary objectives of documenting the presence or absence of Willow Flycatchers, and determining their status as territorial versus migrant. This protocol primarily is a call-playback technique, a proven method for eliciting response from nearby Willow Flycatchers (Seutin, 1987; Craig and others, 1992), both territorial and migrants. The premise of the call-playback technique is to simulate a territorial intrusion by another Willow Flycatcher, which generally will elicit a defensive response by the territorial bird, increasing its detectability. At each site, surveyors should broadcast a series of recorded Willow Flycatcher *fitz-bews* and *britts*, and look and listen for responses. In addition to maximizing the likelihood of detecting nearby flycatchers, this method also allows for positive identification by comparing the responding bird's vocalizations to the known Willow Flycatcher recording.

Documenting Presence / Absence—Begin surveys as soon as there is enough light to safely walk (about 1 hour before sunrise) and end by about 0900–1030 hours, depending on the temperature, wind, rain, background noise, and other environmental factors. Use your best professional judgment whether to conduct surveys that day based on local field conditions. If the detectability of flycatchers is being reduced by environmental factors, surveys planned for that day should be postponed until conditions improve. If observers are camped in or near potential Willow Flycatcher habitat, afternoons and evenings can be spent doing site reconnaissance and planning a survey strategy for the following morning. If camped immediately adjacent to survey sites, surveyors can awaken early and listen for flycatchers singing during the predawn period (0330–0500 hours), when territorial males often sing loudly.

Conduct surveys from within rather than from the perimeter of the sites, while limiting the breaking of vegetation or damaging the habitat. If surveys cannot be conducted from within the habitat, walk along the perimeter and enter the patch at intervals to broadcast the vocalizations and listen for responses. Flycatchers often respond most strongly if the recording is played from within the habitat and territory, rather than from the periphery. In addition, it can be surprisingly difficult to hear singing Willow Flycatchers that are even a short distance away amidst the noise generated by other singing and calling birds, roads, noisy streams, and other extraneous sounds. Therefore, it is preferable to survey from within the habitat, but always move carefully to avoid disturbing habitat or nests. Surveying from the periphery should not be conducted only for the sake of convenience, but is allowable for narrow linear reaches or when absolutely necessary due to safety considerations.

Because flycatchers may be clustered within only a portion of a habitat patch, it is critical to survey all suitable habitat within the patch. Small linear sites may be thoroughly covered by a single transect through the patch. For larger sites, choose a systematic survey path that assures complete patch coverage throughout the length and breadth of the site. This may require multiple straight transects, serpentine, zig-zag, or criss-cross routes. Aerial photographs and previous survey forms are valuable tools to help plan and conduct surveys, and to assure complete coverage. Always move carefully through the habitat to avoid disturbing vegetation or nests.

Initially approach each site and stand quietly for 1–2 minutes or longer, listening for spontaneously singing flycatchers. A period of quiet listening is important because it helps acclimate surveyors to background noises that can be quite loud due to roads, aircraft, machinery, waterways, and other sounds. It also allows surveyors to recognize and shift attention away from the songs and calls of other bird species, letting them focus on listening for flycatchers. Although it happens rarely, some singing Willow Flycatchers will actually stop vocalizing and approach quietly in response to a broadcast song, perhaps in an effort to locate what they perceive as an intruding male. Therefore, playing a recording before listening for singing individuals has at least some potential of reducing detectability.

If you do not hear singing flycatchers during the initial listening period, broadcast the Willow Flycatcher song recording for 10–15 seconds; then listen for approximately 1 minute for a response. Repeat this procedure (including a 10-second quiet pre-broadcast listening period) every 20–30 m throughout each survey site, more often if background noise is loud. The recording should be played at about the volume of natural bird calls, and not so loud as to cause distortion of the broadcast. We recommend that the playback recording include a series of *fitz-bews* interspersed with several *britts*.

Response to the broadcast call could take several forms. Early in the breeding season (approximately May–mid-June), a responding Willow Flycatcher will usually move toward the observer and *fitz-bew* or *whitt* from within or at the top of vegetation. Territorial Willow Flycatchers almost always vocalize strongly when a recording is played in their territory early in the season. If there are several flycatchers present in an area, some or all may start singing after hearing the recording or the first responding individual. Flycatchers can often hear the recording from far away but will not usually move outside of their territory, so listen for distant responses. Also, stay alert and listen for flycatchers vocalizing behind you that may not have responded when you were first in their territory. Another common flycatcher response is alarm calls (*whitts*) or interaction twitters from within nearby vegetation, particularly once nesting has begun. Willow Flycatchers will often sing after a period of *whitting* in response to a recording, so surveyors hearing *whitts* should remain in the area and quietly listen for *fitz-bews* for several minutes. Because some flycatchers may initially respond by approaching quietly, particularly during periods 2 and 3, it is critical to watch carefully for responding birds.

If you detect flycatchers that appear particularly agitated, it is possible that you are in close proximity to their nest. Agitated flycatchers may swoop down at the surveyor, snap their beaks, and otherwise appear distressed. Exercise extreme caution so as to not accidently disturb the nest, and move slowly away from the immediate area.

For the purpose of this protocol, detection of a *fitz-bew* song is essential to identify a bird as a Willow Flycatcher. Similar appearing species (including other *Empidonax* flycatchers) occur as migrants, and even breeders, at potential Willow Flycatcher sites. A few of these other species may even approach a broadcast Willow Flycatcher song and respond with vocalizations. In order to standardize interpretation of survey results and assure a high degree of confidence in surveys conducted by biologists of varying experience and skill, positive identification must be based on detection of the Willow Flycatcher's most unique characteristic—its song. It is important to remember that the *whitt* call is not unique to Willow Flycatchers, and therefore cannot serve as the basis of a positive identification. However, *whitts* are extremely useful for locating flycatchers and identifying areas needing follow-up visits. Loud, strong *whitting* may indicate a nearby nest, dictating that surveyors exercise extra caution moving through the area.

Whenever a verified or suspected Willow Flycatcher is detected, be careful not to overplay the song recording. Excessive playing could divert the bird from normal breeding activities or attract the attention of predators and brood parasites. Wildlife management agencies may consider overplaying the recording as "harassment" of the flycatcher, and this is not needed to verify species identification. Although flycatchers usually sing repeatedly once prompted, even a single *fitz-bew* is sufficient for verification. If you have played a recording several times and a bird has approached but has not *fitz-bewed*, do not continue playing the recording. If a potential Willow Flycatcher responds, approaches or *whitts* but does not sing, it is best to carefully back away and wait quietly. If it is a Willow Flycatcher, it probably will sing within a short time (5–10 minutes). Another option is to return to the same site early the following morning to listen for or attempt to elicit singing again. If you are still uncertain, record the location with your GPS, record comments on the survey form, and follow-up on the detection during subsequent surveys. If possible, request the assistance of an experienced surveyor to determine positive identification.

If more habitat remains to be surveyed, continue onward once a flycatcher is detected and verified. In doing so, move 30–40 m past the current detection before again playing the recording, and try to avoid double-counting flycatchers that have already responded. Willow Flycatchers, particularly unpaired males, may follow the broadcast song for 50 m or more.

Looking For and Recording Color Bands.—Several research projects have involved the capture and banding of Willow Flycatchers at breeding sites across the Southwest. In such projects, flycatchers are banded with one or more small colored leg bands, including a federal numbered band. As a result, surveyors may find color-banded individuals at their survey sites, and identification and reporting of the band combination can provide important data on flycatcher movements, survivorship, and site fidelity.

To look for bands, move to get a good view of the flycatcher's legs. This may be difficult in dense vegetation, but flycatchers commonly perch on more exposed branches at the edges of their territory or habitat patch. If bands are seen, carefully note the band colors. If there is more than one band on a leg, differentiate the top (farthest up the leg) from the bottom (closest to the foot), and those on the bird's left leg versus the right leg. If you are unsure of the color, do not guess. Instead, record the color as unknown. Incorrect color-band data are worse than incomplete data, so only record colors of which you are certain. The fact that a banded bird was seen, even without being certain of its color combination, is very important information. Record the color-band information on the survey form, and report the sighting to the appropriate State or Federal contact as soon as you return from the survey that day.

Determining the Number of Territories and Pairs.— Accurately determining the number of breeding territories and pairs can be more difficult than determining simple presence or absence. Flycatcher habitat is usually so dense that visual detections are difficult, and seeing more than one bird at a time is often impossible. Flycatchers sing from multiple song perches within their territories, and may be mistaken for more than one flycatcher. A flycatcher responding to or following a surveyor playing a recording may move considerable distances in a patch and thus be counted more than once. Territorial male flycatchers often sing strongly, but so do many migrants and some females, particularly in response to call-playback (Seutin, 1987; Unitt, 1987; Sogge and others, 1997b). Rangewide, many territorial male flycatchers are unmated, particularly those in small breeding groups. For these reasons, each singing flycatcher may not represent a territory or a mated pair. Following the established survey protocol and carefully observing flycatcher behavior can help determine if you have detected migrants, territorial birds, breeders, unmated birds, or pairs.

Given sufficient time, effort and observation, it is usually possible to approximate the number of territories and pairs. First, listen carefully for simultaneously singing flycatchers. Note the general location of each bird—especially concurrently singing individuals—on aerial photographs, map, or a site sketch. Spend some time watching each flycatcher to determine approximate boundaries of its territory, and how it interacts with other flycatchers. If one or more singing birds stay primarily in mutually exclusive areas, they can be considered as separate territories. To determine if a flycatcher is paired, watch for interactions within a territory. Refer to the section, "Determining Breeding Status" for signs of pairing and breeding activity. Do not report a territorial male as a pair unless you observe one or more of the signs listed below. In some cases, it may be possible only to estimate the number of singing individuals. In other cases, it may take multiple site visits to differentiate territories or pairs.

Determining Breeding Status.—One way to determine if the flycatchers found at a particular site are migrants or territorial is to find out if they are still present during the "non-migrant" period, which generally is from about June 15 to July 20 (Unitt, 1987). A Willow Flycatcher found during this time probably is a territorial bird, although there is a small chance it could be a non-territorial floater (Paxton and others, 2007). If the management question is simply whether the site is a potential breeding area, documenting the presence of a territorial flycatcher during the non-migrant period may meet all survey objectives, and the site may not need to be resurveyed during the remainder of that breeding season.

However, in some cases, surveyors will be interested in knowing not only if territorial Southwestern Willow Flycatchers are present at a site, but also whether breeding or nesting efforts are taking place. Some males maintain territories well into July yet never succeed in attracting a mate, so unpaired males are not uncommon (McLeod and others, 2007; Ellis and others, 2008; Ahlers and Moore, 2009). Thus, an assumption that each singing male represents a breeding pair may not be well founded, especially in small populations. If it is important to determine whether a pair is present and breeding in that territory, move a short distance away from where the bird was sighted, find a good vantage point, and sit or lie quietly to watch for evidence of breeding. Signs of breeding activity include:

a. observation of another unchallenged Willow Flycatcher in the immediate vicinity (indicates possible pair);
b. *whitt* calls between nearby flycatchers (indicates possible pair);
c. interaction twitter calls between nearby flycatchers (indicates possible pair);
d. countersinging or physical aggression against another flycatcher or bird species (suggests territorial defense);
e. physical aggression against cowbirds (suggests nest defense);
f. observation of Willow Flycatchers copulating (verifies attempted breeding);
g. flycatcher carrying nest material (verifies nesting attempt, but not nest outcome);
h. flycatcher carrying food or fecal sac (verifies nest with young, but not nest outcome);
i. locating an active nest (verifies nesting). Recall that general survey permits do not authorize nest searching or monitoring, and see section, "Special Considerations";
j. observation of adult flycatchers feeding fledged young (verifies successful nesting).

You may be able to detect flycatcher nesting activity, especially once the chicks are being fed. Adults feed chicks at rates of as many as 30 times per hour, and the repeated trips to the nest tree or bush are often quite evident. Be sure to note on the flycatcher survey form any breeding activity that is observed, including detailed descriptions of the number of birds, and specific activities observed. Also note the location of breeding activities on an aerial photograph, map, or sketch of the area.

The number of flycatchers found at a site also can provide a clue as to whether they are migrants or territorial birds. Early season detections of single, isolated Willow Flycatchers often turn out to be migrants. However, discovery of a number of Willow Flycatchers at one site usually leads to verification that at least some of them remain as local breeders. This underscores the importance of completing a thorough survey of each site to be confident of the approximate number of flycatchers present.

In some cases, regardless of the time and diligence of your efforts, it will be difficult to determine the actual breeding status of a territorial male. In these instances, use your best professional judgment, or request the assistance of an experienced surveyor or an agency flycatcher coordinator to interpret your observations regarding breeding status.

Reporting Results.—There is little value in conducting formal surveys if the data are not recorded and submitted. Fill in all appropriate information on the Willow Flycatcher survey form while still in the field, and mark the location of detections on a copy of the USGS topographic map. Make a habit of reviewing the form before you leave any site—trying to remember specific information and recording it later can lead to missing and inaccurate data. Note the location of the sighting on an aerial photograph or sketch of the site. Attaching photographs of the habitat also is useful. Whenever a Willow Flycatcher territory or nest site is confirmed, notify the USFWS or appropriate State wildlife agency as soon as you return from the field. The immediate reporting of flycatcher detections or nests may differ among USFWS regions and States—discuss these reporting procedures with your respective State and USFWS flycatcher coordinators.

Complete a survey form (appendix 1) for each site surveyed, whether or not flycatchers are detected. "Negative data" (that is, a lack of detections) are important to document the absence of Willow Flycatchers and help determine what areas have already been surveyed. Make and retain a copy of each survey form, and submit the original or a legible copy. Electronic copies of the survey forms also are acceptable and are available online (http://sbsc.wr.usgs.gov/cprs/research/projects/swwf/). All survey forms must be submitted to the USFWS and the appropriate State wildlife agency by the specified deadline identified in your permits. Timely submission of survey data is a permit requirement, and will ensure the information is included in annual statewide and regional reports.

Special Considerations

To avoid adverse impacts to Willow Flycatchers, follow these guidelines when performing all surveys:

1. Obtain all necessary Federal, State, and agency permits and permissions prior to conducting any surveys. Failure to do so leaves you liable for violation of the Endangered Species Act, various State laws, and prosecution for trespass.
2. Do not play the recording more than necessary or needlessly elicit vocal responses once Willow Flycatchers have been located and verified. This may distract territorial birds from caring for eggs or young, or defending their territory. If flycatchers are vocalizing upon arrival at the site, and your objective is to determine their presence or absence at a particular site—there is no need to play the recording. Excessive playing of the recording also may attract the attention of predators or brood parasites. Stop playing the survey recording as soon as you have confirmed the presence of a Willow Flycatcher, and do not play the recording again until you have moved 30–40 m to the next survey location.
3. Proceed cautiously while moving through Willow Flycatcher habitat. Continuously check the area around you to avoid disturbance to nests of Willow Flycatchers and other species. Do not break understory vegetation, even dead branches, to create a path through the surveyed habitat.
4. Do not approach known or suspected nests. Nest searches and monitoring require specific State and Federal permits, have their own specialized methodologies (Rourke and others, 1999), and are not intended to be a part of this survey protocol.
5. If you find yourself close to a known or suspected nest, move away slowly to avoid startling the birds or force-fledging the young. Avoid physical contact with the nest or nest tree, to prevent physical disturbance and leaving a scent. Do not leave the nest area by the same route that you approached. This leaves a “dead end” trail that could guide a potential predator to the nest/nest tree. If nest monitoring is a component of the study, but you are not specifically permitted to monitor the nest, store a waypoint with your GPS, affix flagging to a nearby tree at least 10 m away, and record the compass bearing to the nest on the flagging. Report your findings to an agency flycatcher coordinator or a biologist who is permitted to monitor nests.
6. If you use flagging to mark an area where flycatchers are found, use it conservatively and make certain the flagging is not near an active nest. Check with the property owner or land-management agency before flagging to be sure that similar flagging is not being used for other purposes in the area. Unless conducting specific and authorized/permitted nest monitoring, flagging should be placed no closer than 10 m to any nest. Keep flagging inconspicuous from general public view to avoid attracting people or animals to an occupied site, and remove it at the end of the breeding season.
7. Watch for and note the presence of potential nest predators, particularly birds, such as Common Ravens (*Corvus corax*), American Crows (*Corvus brachyrhynchos*), jays, and magpies. If such predators are in the immediate vicinity, wait for them to leave before playing the recording.
8. Although cowbird parasitism is no longer considered among the primary threats to flycatcher conservation it remains useful to note high concentrations of cowbirds in the comment section of the survey form. While conducting surveys, avoid broadcasting the flycatcher vocalizations if cowbirds are nearby, especially if you believe you may be close to an active flycatcher territory. The intent of not broadcasting flycatcher vocalizations is to reduce the potential for attracting cowbirds to a flycatcher territory or making flycatcher nests more detectable to cowbirds.
9. Non-indigenous plants and animals can pose a significant threat to flycatcher habitat and may be unintentionally spread by field personnel, including those conducting flycatcher surveys. Simple avoidance and sanitation measures can help prevent the spread of these organisms to other environments. To avoid being a carrier of non-indigenous plants or animals from one field site to another visually inspect and clean your clothing, gear, and vehicles before moving to a different field site. A detailed description on how to prevent and control the spread of these species is available by visiting the Hazard Analysis and Critical Control Point Planning for Natural Resource Management web site (http://www.haccp-nrm.org). One species of particular interest is the tamarisk leaf-beetle (*Diorhabda* spp.). If you observe defoliation of saltcedar while conducting flycatcher surveys and believe that *Diorhabda* beetles may be responsible, notify your USFWS coordinator immediately. Other non-native species of concern in survey locations are the quagga mussel (*Dreissena rostriformis bugensis*), cheatgrass (*Bromus tectorum*), red brome (*Bromus rubens*), giant salvinia (*Salvinia molesta*), water milfoil (*Myriophyllum spicatum*), parrot’s feather (*M. aquaticum*), and amphibian chytrid fungus (*Batrachochytrium dendrobatidis*).

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Appendix 1. Willow Flycatcher Survey and Detection Form

Always check the U.S. Fish and Wildlife Service Arizona Ecological Services Field Office web site (http://www.fws.gov/southwest/es/arizona/) for the most up-to-date version.

Willow Flycatcher (WIFL) Survey and Detection Form (revised April 2010)

Site Name____ State______ County ___________________________
USGS Quad Name ____ Elevation _______________________ (meters)
Creek, River, Wetland, or Lake Name____

Is copy of USGS map marked with survey area and WIFL sightings attached (as required)? Yes___ No____

Survey Coordinates: Start: E___________________ N______________________ UTM Datum_______(See instructions)
Stop: E___________________ N______________________ UTM Zone ________

If survey coordinates changed between visits, enter coordinates for each survey in comments section on back of this page.

***** Fill in additional site information on back of this page *****

Survey # Observer(s) (Full Name)	Date (m/d/y) Survey time	Number of Adult WIFLs	Estimated Number of Pairs	Estimated Number of Territories	Nest(s) Found? Y or N If Yes, number of nests	Comments (e.g., bird behavior; evidence of pairs or breeding; potential threats [livestock, cowbirds, *Diorhabda* spp.]). If *Diorhabda* found, contact USFWS and State WIFL coordinator	GPS Coordinates for WIFL Detections (this is an optional column for documenting individuals, pairs, or groups of birds found on each survey). Include additional sheets if necessary.			
Survey # 1 Observer(s)	Date Start Stop Total hrs ___						# Birds	Sex	UTM E	UTM N
Survey # 2 Observer(s)	Date Start Stop Total hrs ___						# Birds	Sex	UTM E	UTM N
Survey # 3 Observer(s)	Date Start Stop Total hrs ___						# Birds	Sex	UTM E	UTM N
Survey # 4 Observer(s)	Date Start Stop Total hrs ___						# Birds	Sex	UTM E	UTM N
Survey # 5 Observer(s)	Date Start Stop Total hrs ___						# Birds	Sex	UTM E	UTM N
Overall Site Summary Totals do not equal the sum of each column. Include only resident adults. Do not include migrants, nestlings, and fledglings. Be careful not to double count individuals. Total Survey Hrs________		Total Adult Residents	Total Pairs	Total Territories	Total Nests	Were any Willow Flycatchers color-banded? Yes___ No ___ If yes, report color combination(s) in the comments section on back of form and report to USFWS.				

Reporting Individual _____________________________________ Date Report Completed________ ____________________
US Fish and Wildlife Service Permit #_______________________State Wildlife Agency Permit #_______________________

<u>Submit</u> form to USFWS and State Wildlife Agency by September 1st. Retain a copy for your records.

Fill in the following information completely. Submit form by September 1st. Retain a copy for your records.

Reporting Individual ____Phone # ___________________________
Affiliation ____ E-mail ____________________________
Site Name____Date Report Completed _______________

Did you verify that this site name is consistent with that used in previous years? Yes ____ No _____ Not Applicable ___
If site name is different, what name(s) was used in the past?____
If site was surveyed last year, did you survey the same general area this year? Yes ____ No ____ If no, summarize below.
Did you survey the same general area during each visit to this site this year? Yes ____ No ____ If no, summarize below.

Management Authority for Survey Area : Federal____ Municipal/County ____ State ____ Tribal ____ Private ____
Name of Management Entity or Owner (e.g., Tonto National Forest) ____

Length of area surveyed: ___________ (meters)

Vegetation Characteristics: Mark the category that best describes the predominant tree/shrub foliar layer at this site (check one):

_____ Native broadleaf plants (entirely or almost entirely, > 90% native, includes high-elevation willow)

_____ Mixed native and exotic plants (mostly native, 50 - 90% native)

_____ Mixed native and exotic plants (mostly exotic, 50 - 90% exotic)

_____ Exotic/introduced plants (entirely or almost entirely, > 90% exotic)

Identify the 2-3 predominant tree/shrub species in order of dominance. Use scientific name.
____

Average height of canopy (Do not include a range): _______________________________ (meters)

Attach copy of USGS quad/topographical map (REQUIRED) of survey area, outlining survey site and location of WIFL detections.
Attach sketch or aerial photo showing site location, patch shape, survey route, location of any WIFLs or WIFL nests detected.
Attach photos of the interior of the patch, exterior of the patch, and overall site; describe any unique habitat features.

Comments (attach additional sheets if necessary)
____
____
____
____
____
____

Territory Summary Table. Provide the following information for each verified territory at your site.

Territory Number	All Dates Detected	UTM N	UTM E	Pair Confirmed? Y or N	Nest Found? Y or N	Description of How You Confirmed Territory and Breeding Status (e.g., vocalization type, pair interactions, nesting attempts, behavior)

Attach additional sheets if necessary

Appendix 2. Willow Flycatcher Survey Continuation Sheet / Territory Summary Table

Always check the U.S. Fish and Wildlife Service Arizona Ecological Services Field Office web site (http://www.fws.gov/southwest/es/arizona/) for the most up-to-date version.

Willow Flycatcher Survey Continuation Sheet

(For reporting additional detections and territories; append to Survey and Detection form)

Reporting Individual ________________________________ Phone # ____________________
Affiliation ________________________________ E-mail ____________________
Site Name ________________________________ Date Report Completed ____________

Territory Number	All Dates Detected	UTM E	UTM N	Pair Confirmed? Y or N	Nest Found? Y or N	Description of How You Confirmed Territory and Breeding Status (e.g., vocalization type, pair interactions, nesting attempts, behavior)

Comments ____

Appendix 3. Instructions for Completing the Willow Flycatcher Survey and Detection Form and the Survey Continuation Sheet

These instructions are provided as guidance for completing the standard survey form. It is particularly important to provide the correct type and format of information for each field. Complete and submit your survey forms to both the appropriate State Willow Flycatcher coordinator and the U.S. Fish and Wildlife Service (USFWS) by September 1 of the survey year. You also may complete forms digitally (Microsoft© Word or Excel) and submit them via email with attached or embedded topographic maps and photographs.

Page 1 of Survey Form

Site Name. Standardized site names are provided by the flycatcher survey coordinators for each State and should be consistent with the naming of other sites that might be in the area. If the site is new, work with your State or USFWS flycatcher coordinator to determine suitable site names before the beginning of the survey season. If the site was previously surveyed, use the site name from previous years (which can be obtained from the State or USFWS flycatcher coordinator). If you are uncertain if the site was previously surveyed, contact your State or USFWS flycatcher coordinator.

USGS Quad Name. Provide the full quad name, as shown on the appropriate standard 7.5-minute topographic maps.

Creek, River, Wetland, or Lake Name. Give the name of the riparian feature, such as the lake or watercourse, where the survey is being conducted.

Survey Coordinates. Provide the start and end points of the survey, which will indicate the linear, straight-line extent of survey area, based on Universal Transverse Mercator coordinates (UTMs). California surveyors only: provide latitude/longitude geographic coordinates instead of UTMs in the UTM fields and identify them as such. If the start and end points of the survey changed significantly among visits, enter separate coordinates for each survey in the comments section on the back of the survey sheet. Note that we do not need the coordinates for the detailed path taken by the surveyor(s).

Datum. Indicate the datum in which the coordinates are expressed: NAD27, WGS84, or NAD83. The datum can be found in the settings of most GPS units. Note that Arizona prefers NAD27 and New Mexico prefers NAD83.

Zone. Provide the appropriate UTM zone for the site, which is displayed along with the coordinates by most GPS units. Zones for California are 10, 11, or 12. The zone for Arizona is 12. Zones for New Mexico are 12 or 13.

Survey #. Survey 1 – 5. See the protocol for an explanation of the number of required visits for each survey period. **Note:** A survey is defined as a complete protocol-based survey that occurs over no more than 1 day. If a site is so large as to require more than a single day to survey, consider splitting the site into multiple subsites and use separate survey forms for each. Casual site visits, pre-season or supplemental visits, or follow-up visits to check on the status of a territory should not be listed in this column, but should be documented in the Comments section on page 2 or in the survey continuation sheet.

Date. Indicate the date that the survey was conducted, using the format mm/dd/yyyy.

Start and **Stop.** Start and stop time of the survey, given in 24-hour format (e.g., 1600 hours rather than 4:00 p.m.).

Total hours. The duration of time (in hours) spent surveying the site, rounded to the nearest tenth (0.1) hour. For single-observer surveys, or when multiple observers stay together throughout the survey, total the number of hours from survey start to end. If two or more observers surveyed sections of the site concurrently and independently, sum the number of hours each observer spent surveying the site.

Number of Adult WIFLs. The total number of individual adult Willow Flycatchers detected during this particular survey. Do not count nestlings or recently fledged birds.

Number of Pairs. The number of breeding pairs. Do not assume that any bird is paired; designation of birds as paired should be based only on direct evidence of breeding behaviors described in the protocol. If there is strong evidence that the detected bird is unpaired, enter "0". If it is unknown whether a territorial bird is paired, enter "–". Note that the estimated number of pairs can change over the course of a season.

Number of Territories. Provide your best estimate of the number of territories, defined as a discrete area defended by a resident single bird or pair. This is usually evidenced by the presence of a singing male, and possibly one or more mates. Note that the estimated number of territories may change over the course of a season.

Nest(s) Found? Yes or No. If yes, indicate the number of nests. Renests are included in this total.

Comments about this survey. Describe bird behavior, evidence of pairs or breeding, evidence of nest building, evidence of nestlings/fledglings, nesting, vocalizations (e.g., interaction twitter calls, *whitts, britts, wheeos, fitz-bews*/countersinging), potential threats (e.g., livestock, cowbirds, saltcedar leaf beetles [*Diorhabda* spp.] etc.). If *Diorhabda* beetles are observed, contact your USFWS and State flycatcher coordinator immediately. Please be aware that permits are needed for nest monitoring.

GPS Coordinates for WIFL Detections. Provide the number of birds (e.g., unpaired, paired, or groups of birds) and corresponding UTMs. If known, provide the sex of individuals.

Overall Site Summary. For each of these columns, provide your best estimate of the overall total for the season. Do not simply total the numbers in each column. In some cases where consistent numbers were detected on each survey, the overall summary is easy to determine. In cases where numbers varied substantially among the different surveys, use professional judgment and logic to estimate the most likely number of adults, pairs, and territories that were consistently present. Be careful not to double count individuals. Record only territorial adult Southwestern Willow Flycatchers, do not include migrants, nestlings, or fledglings in the overall summary. In complex cases, consult with your State or USFWS flycatcher coordinator.

Total Survey Hours. The sum of all hours spent surveying the site.

Were any WIFLs color-banded? Circle or highlight "Yes" or "No". If yes, report the sighting and color combination (if known) in the comments section on back of form, and contact your USFWS coordinator within 48 hours after returning from the survey. Note that identifying colors of bands is difficult and might require follow-up visits by experienced surveyors.

Reporting Individual. Indicate the full first and last name of the reporting individual.

Date Report Completed. Provide the date the form was completed in mm/dd/yyyy format.

U.S. Fish and Wildlife Service Permit #. List the full number of the required federal permit under which the survey was completed.

State Wildlife Agency Permit #. If a State permit is required by the State in which the survey was completed, provide the full number of the State permit. State permits are required for Arizona and California. State permits are recommended for New Mexico.

Page 2 of Survey Form

Affiliation. Provide the full name of the agency or other affiliation (which is usually the employer) of the reporting individual.

Phone Number. Self-explanatory; include the area code.

E-mail. Self-explanatory.

Was this site surveyed in a previous year? Indicate "Yes", "No", or "Unknown."

Did you verify that this site name is consistent with that used in previous years? Indicate "Yes" or "No". This can be determined by checking survey forms from previous years or consulting with agency flycatcher coordinators.

If site name is different, what name(s) was used in the past? Enter the full site name that was used in previous years.

If site was surveyed last year, did you survey the same general area this year? Indicate "Yes" or "No". If no, indicate the reason and how the survey varied in the Comments section.

Did you survey the same general area during each visit to this site this year? If no, indicate the reason in the Comments section and delineate the differing route of each survey on the topographical map.

Management Authority for Survey Area. Mark the appropriate management authority.

Name of Management Entity or Owner (e.g., Tonto National Forest). Provide the name of the organization or person(s) responsible for management of the survey site.

Length of area surveyed. Estimate the linear straight-line distance of the length of the area surveyed, in kilometers. This is not an estimate of the total distance walked throughout the survey site. Do not provide a range of distances.

Vegetation Characteristics: Mark only one of the categories that best describes the predominant tree/shrub foliar layer at the site.

Native broadleaf habitat is composed of entirely or almost entirely (i.e., > 90%) native broadleaf plants.

Mostly native habitat is composed of 50–90% native plants with some (i.e., 10–50%) non-native plants.

Mostly exotic habitat is composed of 50–90% non-native plants with some (i.e., 10–50%) native plants.

Exotic/introduced habitat is composed entirely or almost entirely (i.e., > 90%) of non-native plants.

Identify the 2–3 predominant tree/shrub species in order of dominance. Identify by scientific name.

Average height of canopy. Provide the best estimate of the average height of the top of the canopy throughout the patch. Although canopy height can vary, give only a single (not a range) overall height estimate.

Attach the following: (1) copy of USGS quad/topographical map (REQUIRED) of survey area, outlining survey site and location of WIFL detections; (2) sketch or aerial photo showing site location, patch shape, survey route, location of any detected WIFLs or their nests; (3) photos of the interior of the patch, exterior of the patch, and overall site. Describe any unique habitat features in Comments. Include the flycatcher territory number and GPS location. You also may include a compact disc of photographs.

Comments. Include any information that supports estimates of total territory numbers and breeding status. You may provide additional information on bird behavior, banded birds, evidence of pairs or breeding, nesting, potential threats (e.g., livestock, cowbirds, saltcedar leaf beetles [*Diorhabda* spp.] etc.), and changes in survey length and route throughout the season. Attach additional pages or use the continuation sheet if needed.

Table. If Willow Flycatchers are detected, complete the table at the bottom of the form. Identify flycatchers by territory number and include the dates detected, UTMs, whether or not pairs were detected, and whether or not nests were located. Also describe the observation. For example, the surveyor might have observed and heard a bird *fitz-bew* from an exposed perch, heard and observed two birds interacting and eliciting a twitter call, heard a bird *fitz-bew* while observing another carrying nesting material, heard birds from territory 1 and 2 countersinging, etc. This information provides supporting information for territory and breeding status. Use the continuation sheet if needed.

Appendix 4. Example of a Completed Willow Flycatcher Survey and Detection Form (with map)

Willow Flycatcher (WIFL) Survey and Detection Form (revised April, 2010)

Site Name: **DL-08** State: **New Mexico** County: **Socorro**

USGS Quad Name: **Paraje Well** Elevation: **1,356** (meters)

Creek, River, or Lake Name: **Rio Grande**

Is copy of USGS map marked with survey area and WIFL sightings attached (as required)? ***Yes*** **X** ***No*** ____

Survey Coordinates: Start: E **306,009** N **3,715,506** UTM Datum: **NAD 83** (See instructions)

Stop: E **304,339** N **3,711,922** UTM Zone: **13**

If survey coordinates changed between visits, enter coordinates for each survey in comments section on back of this page.

*****Fill in additional site information on back of this page*****

Survey # Observer(s) (Full Name)	Date (m/d/y) Survey Time	Number of Adult WIFLs	Estimated Number of Pairs	Estimated Number of Territories	Nest(s) Found? Y or N If Yes, number of nests	Comments (e.g., bird behavior; evidence of pairs or breeding;-potential threats [livestock, cowbirds, *Diorhabda* spp.]). If *Diorhabda* found, contact USFWS and State WIFL coordinator.
Survey # 1 Observer(s): D. Savage	Date: 5/24/2009 Start: 5:45 Stop: 10:15 Total hrs: 4.5	5	0	5	N	Suitable breeding habitat dispersed throughout site. WIFLs were very vocal, and covering large areas. No obvious signs of pairing were observed. Approximately 10 head of cattle were found within this site.
Survey # 2 Observer(s): S. Kennedy	Date: 6/10/2009 Start: 6:00 Stop: 10:15 Total hrs: 4.3	11	4	7	Y (3)	Portions of site are flooded, 1-2 ft deep. Two males found during 1st survey appear unpaired. Three pairs confirmed based on nesting, and another pair suspected based on vocal interactions and nonaggressive behavior with another flycatcher. Two additional territories (1 pair and 1 unpaired male) found during this survey.
Survey # 3 Observer(s): S. Kennedy	Date: 6/21/2009 Start: 5:30 Stop: 10:00 Total hrs: 4.5	12	5	7	Y (4)	Portions of site still flooded. All territories found in Survey 2 are still active. The two males found during Surveys #1 and #2, still believed to be unpaired. All other territories are believed to be paired. Several cows observed in vicinity of active territories.
Survey # 4 Observer(s): D. Moore	Date: 7/1/2009 Start: 6:00 Stop: 10:00 Total hrs: 4.0	12	5	7	Y (4)	Site is no longer flooded, but saturated soils persist throughout most of site. No change in territory numbers or status. All SWFL pairs very quiet - only a few whits and fitz-bews. Light rain over night, vegetation was saturated early in the morning. Lots of mosquitos!
Survey # 5 Observer(s): D. Moore	Date: 7/10/2009 Start: 5:30 Stop: 10:00 Total hrs: 4.5	11	5	6	Y (4)	Site beginning to dry out, some portions still muddy. One of the unpaired males could not be detected. It was hard to hear SWFLs due to breezy conditions early in the morning.

GPS Coordinates for WIFL Detections (this is an optional column for documenting individuals, pairs, or groups of birds found on each survey). Include additional sheets if necessary.

Survey # 1

# Birds	Sex	UTM E	UTM N
1	M	305,276	3,714,926
1	M	305,131	3,714,628
1	M	305,191	3,714,778
1	M	305,394	3,715,009
1	M	305,084	3,714,732

Survey # 2

# Birds	Sex	UTM E	UTM N
1	M	305,276	3,714,926
1	M	305,131	3,714,628
2	M/F	305,191	714,778
2	M/F	305,394	3,715,009
2	M/F	305,084	3,714,732
2	M/F	305,001	3,714,640
1	M	305,010	3,714,524

Survey # 3

# Birds	Sex	UTM E	UTM N
1	M	305,276	3,714,926
1	M	305,131	3,714,628
2	M/F	305,191	3,714,778
2	M/F	305,394	3,715,009
2	M/F	305,084	3,714,732
2	M/F	305,001	3,714,640
2	M/F	305,010	3,714,524

Survey # 4

# Birds	Sex	UTM E	UTM N
1	M	305,276	3,714,926
1	M	305,131	3,714,628
2	M/F	305,191	3,714,778
2	M/F	305,394	3,715,009
2	M/F	305,084	3,714,732
2	M/F	305,001	3,714,640
2	M/F	305,010	3,714,524

Survey # 5

# Birds	Sex	UTM E	UTM N
1	M	305,131	3,714,628
2	M/F	305,191	3,714,778
2	M/F	305,394	3,715,009
2	M/F	305,084	3,714,732
2	M/F	305,001	3,714,640
2	M/F	305,010	3,714,524

Overall Site Summary

Totals do not equal the sum of each column. Include only resident adults. Do not include migrants, nestlings, and fledglings. Be careful not to double count individuals.

Total Adult Residents	Total Pairs	Total Territories	Total Nests
12	5	7	4

Total survey hrs: 21.8

Were any WIFLs color-banded? Yes ____ No **X**

If yes, report color combination(s) in the comments section on back of form and report to USFWS.

Reporting Individual: **Darrell Ahlers** Date Report Completed: **8/20/2009**

US Fish & Wildlife Service Permit #: **TE819475-2** State Wildlife Agency Permit #: **N/A**

Submit form to USFWS and State Wildlife Agency by September 1st. Retain a copy for your records.

Fill in the following information completely. Submit form by September 1st. Retain a copy for your records.

Reporting Individual **Darrell Ahlers** Phone # **(303) 445-2233**
Affiliation **Bureau of Reclamation** E-mail dahlers@usbr.gov
Site Name **DL-08** Date report Completed **8/20/2009**
Was this site surveyed in a previous year? Yes__x__ No____ Unknown____
Did you verify that this site name is consistent with that used in previous yrs? Yes x No ____ Not Applicable ____
If name is different, what name(s) was used in the past? **Not applicable**
If site was surveyed last year, did you survey the same general area this year? Yes x No ____ If no, summarize below.
Did you survey the same general area during each visit to this site this year? Yes x No ____ If no, summarize below.

Management Authority for Survey Area: Federal X Municipal/County ____ State ____ Tribal ____ Private ____
Name of Management Entity or Owner (e.g., Tonto National Forest) **Bureau of Reclamation**

Length of area surveyed: **2.5** (km)

Vegetation Characteristics: Check (only one) category that best describes the predominant tree/shrub foliar layer at this site:

____ Native broadleaf plants (entirely or almost entirely, > 90% native)

X Mixed native and exotic plants (mostly native, 50 - 90% native)

____ Mixed native and exotic plants (mostly exotic, 50 - 90% exotic)

____ Exotic/introduced plants (entirely or almost entirely, > 90% exotic)

Identify the 2-3 predominant tree/shrub species in order of dominance. Use scientific name.
Salix Gooddingii, Populus spp., Tamarix spp.

Average height of canopy (Do not include a range): **6** (meters)

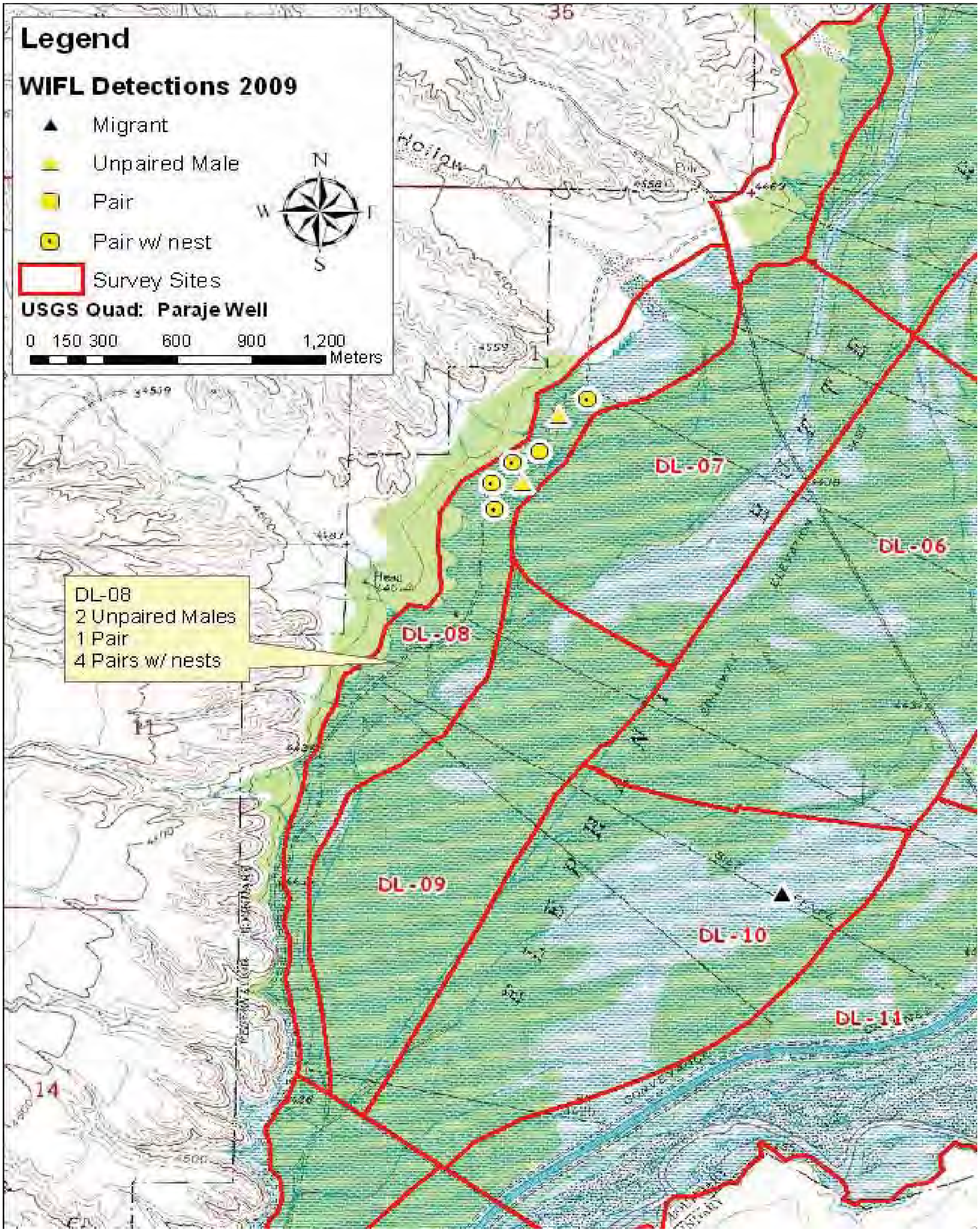
Attach the following: 1) copy of USGS quad/topographical map (REQUIRED) of survey area, outlining survey site and location of WIFL detections;
2) sketch or aerial photo showing site location, patch shape, survey route, location of any detected WIFLs or their nests;
3) photos of the interior of the patch, exterior of the patch, and overall site. Describe any unique habitat features in Comments.

Comments (such as start and end coordinates of survey area if changed among surveys, supplemental visits to sites, unique habitat features.
Attach additional sheets if necessary.
Great habitat with saturated or flooded soils throughout most of the site on 1st survey. Site began to dry by the end of the breeding season. SWFL territories are dominated by Gooddings willow, however Tamarix spp. tends to be increasing in density compared to previous years. Site is supported by flows from the Low Flow Conveyance Channel.

Territory Summary Table. Provide the following information for each verified territory at your site.

Territory Number	All Dates Detected	UTM E	UTM N	Pair Confirmed? Y or N	Nest Found? Y or N	Description of How You Confirmed Territory and Breeding Status (e.g., vocalization type, pair interactions, nesting attempts, behavior)
1 (Unpaired male)	5/24, 6/10,6/21,7/1	305,276	3,714,926	N	N	extended presence at site from 5/24 through 7/1, no evidence of pairing
2 (Unpaired male)	5/24, 6/10,6/21,7/1, 7/10	305,131	3,714,628	N	N	extended presence at site from 5/24 through 7/10, no evidence of pairing
3 (Pair)	5/24, 6/10,6/21,7/1, 7/10	305,191	3,714,778	Y	Y	Pair confirmed based on vocalizations and observation of unchallenged WIFL
4 (Pair w/nest)	5/24, 6/10,6/21,7/1, 7/10	305,394	3,715,009	Y	Y	Confirmed breeding status with nest
5 (Pair w/nest)	5/24, 6/10,6/21,7/1, 7/10	305,084	3,714,732	Y	Y	Confirmed breeding status with nest
6 (Pair w/nest)	6/10,6/21,7/1, 7/10	305,001	3,714,640	Y	Y	Confirmed breeding status with nest
7 (Pair w/nest)	6/10,6/21,7/1, 7/10	305,010	3,714,524	Y	N	Confirmed breeding status with nest

Attach additional sheets if necessary



Legend
WIFL Detections 2009
Migrant
Unpaired Male
Pair
Pair w/ nest
Survey Sites
USGS Quad: Paraje Well
0 150 300 600 900 1,200
Meters
DL-08
2 Unpaired Males
1 Pair
4 Pairs w/ nests
DL - 06
DL - 07
DL - 08
DL - 09
DL - 10
DL - 11

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For more information concerning the research in this report, contact
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Sogge and others—**A Natural History Summary and Survey Protocol for the Southwestern Willow Flycatcher**—Techniques and Methods 2A-10

Appendix D: Yellow-Billed Cuckoo Survey Protocol

Yellow-billed Cuckoo (*Coccyzus americanus*): A Technical Conservation Assessment

Prepared for the USDA Forest Service, Rocky Mountain Region, Species Conservation Project

March 25, 2005

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Peer Review Administered by
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AUTHOR'S BIOGRAPHY

David Wiggins developed an early interest in Ornithology. During his high school years, he worked as a museum assistant under Gary Schnell and George Sutton at the University of Oklahoma. He later earned degrees from the University of Oklahoma (B.Sc. in Zoology), Brock University (M.Sc.- Parental care in Common Terns, under the supervision of Ralph Morris), and Simon Fraser University (Ph.D. – Selection on life history traits in Tree Swallows, under the supervision of Nico Verbeek). This was followed by a National Science Foundation Post-doctoral fellowship at Uppsala University in Sweden, where he studied life history evolution in Collared Flycatchers, and later a Fulbright Fellowship working on the reproductive ecology of tits (Paridae) in Namibia and Zimbabwe. He currently splits time between ecological research programs in Sweden and North America.

COVER PHOTO CREDIT

Yellow-billed cuckoo (*Coccyzus americanus*). Used with the permission of the photographer, Steve Metz.

Summary of Key Components for Conservation of Yellow-billed Cuckoo

In western North America, yellow-billed cuckoos (*Coccyzus americanus*) have undergone catastrophic declines; the eastern subspecies has undergone less rapid declines in most areas since approximately 1980. Direct loss and degradation of low-elevation riparian woodland habitats have been cited as the primary causes for the declines in yellow-billed cuckoos in the western portion of the range. Factors contributing to habitat loss and degradation include alteration of flow schemes in rivers and streams; diversion of water for agricultural and municipal purposes; urban expansion; livestock grazing, which affects understory vegetation and cottonwood/willow recruitment; and pesticide applications which decrease local food supplies and potentially induce toxic accumulations in cuckoos. In the east, the reasons for the now widespread declines are less clear. One potential factor contributing to declines across this species' range in North America is the loss of forested habitat on its wintering grounds in South America. However, little is known of its ecology or distribution in South America, and this remains an area in need of further research.

While it is clear that western populations of yellow-billed cuckoos have undergone drastic declines in both range and abundance, it is important to note that cuckoos are also declining significantly in the east (from the Great Plains eastward), and that this decline has gone largely unnoticed by most regulatory agencies and conservation organizations (e.g., Partners In Flight). This may partly be explained by the fact that cuckoos are still relatively common in many forested habitats in the east, and thus they have not yet registered as a species of concern. However, given the significant recent declines even in the core of their range (e.g., Oklahoma and Kansas), research into the causes of these declines should be initiated while the species is still tractable. Many populations in the west are now so small and isolated that gaining insight into population declines there will be extremely difficult. The identification of the factor(s) contributing to declines in yellow-billed cuckoos on the Great Plains would be a key piece of information in helping to develop a regional management plan.

Conservation measures that may help to slow the decline in abundance of yellow-billed cuckoos include 1) restricting livestock grazing within low-elevation riparian systems, especially in the western portions of Region 2; 2) restoring natural patterns of water flow (i.e., allowing periodic flooding and consequent widening of riparian areas) along Great Plains and western slope river systems; and 3) restricting the use of pesticides in and near riparian woodlands. Two recent habitat manipulation studies have shown that restricting livestock grazing and promoting the expansion of riparian woodlands can have immediate, positive effects on the numbers of breeding yellow-billed cuckoos. The extent to which the elimination of exotic vegetation, especially saltcedar (*Tamarix* spp.), will improve habitat quality for yellow-billed cuckoos is in need of further study. Given that saltcedar elimination programs are currently underway on many southwestern river systems, including those on the Comanche and Cimarron national grasslands, monitoring breeding bird populations on such systems would provide valuable data on the potential benefits of this management action for yellow-billed cuckoos and other riparian species.

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EDITOR: Gary Patton, USDA Forest Service, Rocky Mountain Region

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INTRODUCTION

This conservation assessment is one of many being produced to support the Species Conservation Project for the Rocky Mountain Region (Region 2), USDA Forest Service (USFS). The yellow-billed cuckoo (*Coccyzus americanus*) is the focus of an assessment because it is considered a sensitive species in Region 2 (see **Figure 1** for a map of Region 2). Within the National Forest System, a sensitive species is a plant or animal whose population viability is identified as a concern by a Regional Forester because of significant current or predicted downward trends in abundance and/or in habitat capability that would reduce its distribution [FSM 2670.5 (19)]. A sensitive species may require special management, so knowledge of its biology and ecology is crucial.

This assessment addresses the biology and conservation/management of the yellow-billed cuckoo throughout its range, but with an emphasis on Region 2. This introduction defines the goal of the assessment, outlines its scope, and describes the process used in its production.

Goal

Species conservation assessments produced as part of the Species Conservation Project are designed to provide land managers, biologists, and the public with a thorough discussion of the biology, ecology, conservation, and management of certain species based on current scientific knowledge. Assessment goals limit the scope of the work to critical summaries of scientific knowledge, discussion of broad implications

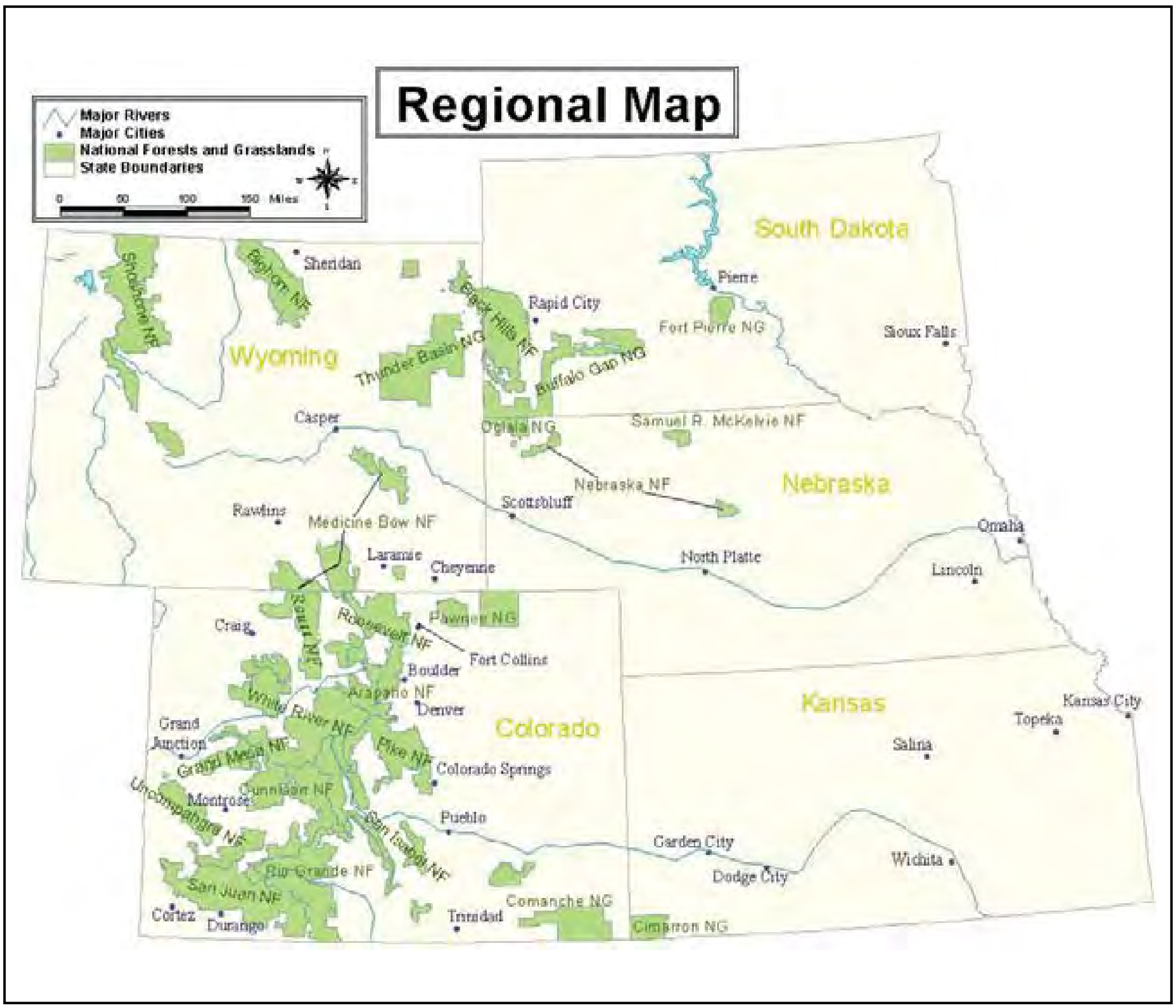

Figure 1. Map of national forests and national grasslands within USDA Forest Service Region 2.

of that knowledge, and outlines of information needs. The assessment does not seek to develop prescriptive management recommendations. Rather, it provides the ecological background upon which management must be based and focuses on the consequences of changes in the environment that result from management (i.e., management implications). Furthermore, this assessment cites management recommendations proposed elsewhere and examines the effectiveness of those recommendations that have been implemented.

Scope and Limitations of Assessment

This conservation assessment examines the biology, ecology, conservation, and management of the yellow-billed cuckoo with specific reference to the geographic and ecological characteristics of the USFS Rocky Mountain Region. Although a majority of the literature on the species originated from field investigations outside the region, this document attempts to place that literature in the ecological and social context of the central and southern Rocky Mountains. Similarly, this assessment is concerned with characteristics of yellow-billed cuckoos in the context of the current environment rather than under historical conditions. The evolutionary environment of the species is considered in conducting the synthesis, but placed in current context.

In producing the assessment, I reviewed refereed literature, non-refereed publications, research reports, and data accumulated by resource management agencies. Not all publications on yellow-billed cuckoos are referenced in the assessment, nor were all published materials considered equally reliable. The assessment emphasizes refereed literature because this is the accepted standard in science. Some non-refereed publications and reports were used in the assessment when refereed information was otherwise unavailable or when recent research results were not yet in published form. However, these resources were regarded with greater skepticism.

Treatment of Uncertainty

Science represents a rigorous, systematic approach to obtaining knowledge. Competing ideas regarding how the world works are measured against observations. However, because our descriptions of the world are always incomplete and our observations are limited, science focuses on approaches for dealing with uncertainty. A commonly accepted approach to science is based on a progression of critical experiments to develop strong inference (Platt 1964). However, it is difficult to conduct experiments that produce clean results in the ecological sciences. Often, we must rely on observations, inference, good thinking, and models to guide our understanding of ecological relations. Confronting uncertainty, then, is not prescriptive. In this assessment, we note the strength of evidence for particular ideas, and we describe alternative explanations where appropriate.

Publication of Assessment on the World Wide Web

To facilitate use of species conservation assessments, they are being published on the Region 2 World Wide Web site. Placing the documents on the Web makes them available to agency biologists and the public more rapidly than publishing them as reports. More importantly, Web publication facilitates their revision, which will be accomplished based on guidelines established by Region 2.

Peer Review

Species conservation assessments developed for the Species Conservation Project have been peer reviewed prior to their release on the Web. This report was reviewed through a process administered by the Society for Conservation Biology, employing two recognized experts on this or related taxa. Peer review was designed to improve the quality of communication and to increase the rigor of the assessment.

MANAGEMENT STATUS AND NATURAL HISTORY

Management Status

Yellow-billed cuckoos are currently a Candidate for listing under the Federal Endangered Species Act in the United States (see summary of the decision at https://ecos.fws.gov/species_profile/SpeciesProfile?spcode=B06R). This designation applies to the western "Distinct Population Segment" that occurs in the following states, provinces, and countries: Washington, Oregon, California, Idaho, Nevada, Montana, Wyoming, Utah, Arizona, Colorado, New Mexico, Texas, British Columbia, and Mexico. In its 12-month finding (see file at: https://ecos.fws.gov/species_profile/Species_FRDoc#top), the U.S. Fish and Wildlife Service determined that the petition to list the yellow-billed cuckoo as Endangered was warranted, but that listing was precluded by higher priority listing actions. In Canada, the western subspecies of the yellow-billed cuckoo is now extirpated in British Columbia, and the eastern subspecies is uncommon in southern Ontario and Quebec. The species is not currently listed as "at risk" in Canada (Committee on the Status of Endangered Wildlife in Canada 2004). Yellow-billed cuckoos are listed by the USDA Forest Service as a sensitive species in Region 2. They are also listed on the Bureau of Land Management State Director's Sensitive Species list for both Wyoming (Bureau of Land Management 2001) and Colorado (Bureau of Land Management 2000).

Most western state Partners in Flight (PIF) Bird Conservation Plans list the yellow-billed cuckoo as a Priority Species (**Table 1**). The Wyoming PIF Bird Conservation Plan ranks the yellow-billed cuckoo as a Highest Priority Species while Colorado does not consider it to be a PIF Priority Species. State PIF plans have not been published for Kansas, Nebraska, or South Dakota. The Natural Heritage Programs within Region 2 states list the yellow-billed cuckoo as imperiled (S2) in Wyoming vulnerable (S3) in Colorado and South Dakota, and secure (S5) in Nebraska and Kansas (**Figure 2**).

Existing Regulatory Mechanisms, Management Plans, and Conservation Strategies

The only federal regulatory mechanism covering yellow-billed cuckoos is the Migratory Bird Treaty Act (16 U.S.C. 703-712), which prohibits "take" of cuckoos. Existing management plans and conservation strategies for the yellow-billed cuckoo have concentrated on declining and extirpated populations in the western portion of the breeding range. Published habitat management plans have focused on endangered populations in California (Laymon and Halterman 1989, Laymon 1998); however, most western state PIF bird conservation plans have developed management recommendations for yellow-billed cuckoos (**Table 2**). In general, all of the published management recommendations for yellow-billed cuckoos have stressed the importance of halting the destruction and degradation of low-elevation riparian woodlands. Loss and degradation of woodlands have occurred through dam construction, water diversions, and flood control schemes, and the resulting flow regime alterations; urban development; clearance for agricultural use; overgrazing by livestock; invasion of exotic vegetation, especially saltcedar (*Tamarix* spp.); and tapping of groundwater for agricultural use.

Biology and Ecology

Systematics

Two subspecies of yellow-billed cuckoo were recognized by the American Ornithologists' Union (1957), with *Coccyzus americanus americanus* east of the Rocky Mountains and *C. a. occidentalis* westward. This split was based upon Ridgway's (1887) analyses that suggested that western cuckoos were larger with stouter bills. More recently, Banks (1988, 1990) measured hundreds of museum specimens and concluded that there was significant overlap between the two subspecies in bill length, bill depth, and wing length. Consequently, Banks concluded that the species should be considered

Table 1. Management status of yellow-billed cuckoos according to Partners in Flight (PIF) Bird Conservation Plans of states within (bolded) and surrounding USDA Forest Service Region 2.

State	Status	Citation
Colorado	Not a Priority Species	Beidleman 2000
Kansas	State PIF plan not published	
Wyoming	Highest Priority Species (Riparian woodland)	Cervoski et al. 2001
Nebraska	State PIF plan not published	
South Dakota	State PIF plan not published	
Montana	Priority Species (Level II*; Riparian deciduous forest)	Casey 2000
New Mexico	Highest Priority Species (Middle-elevation riparian woodland, Agricultural habitat) Priority Species (Southwestern riparian woodland)	Rustay 2001
Utah	Priority Species (Lowland riparian)	Parrish et al. 2002
Idaho	Moderate Priority Species (Riparian)	Ritter 2000
Arizona	Priority Species (Low-elevation riparian)	Latta et al. 1999

*Level II priority species are those for which monitoring and further research are needed.

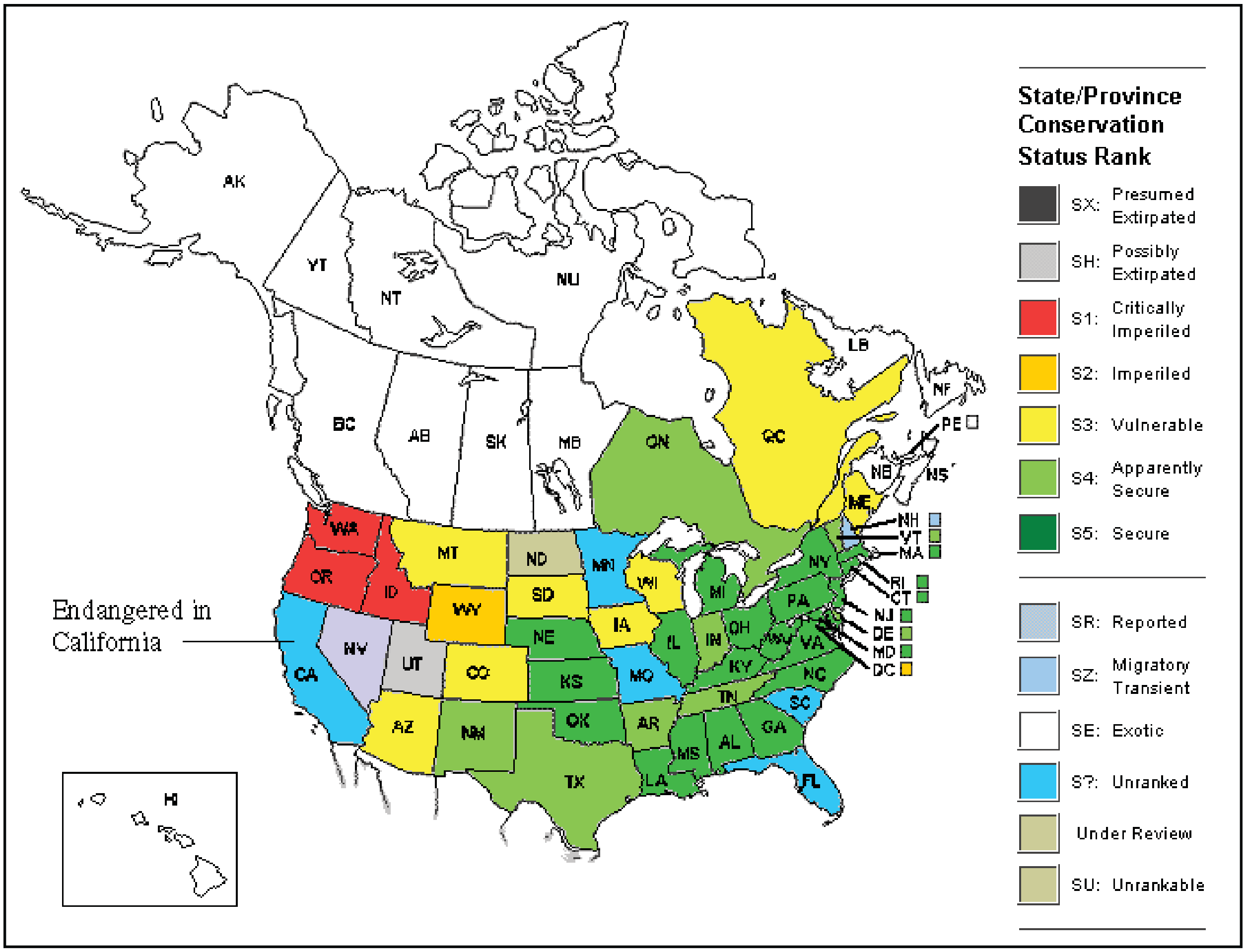

Figure 2. Status of yellow-billed cuckoos in North America based on state and provincial Natural Heritage Program rankings (NatureServe Explorer 2003).

monotypic. Re-analysis of these data by Franzreb and Laymon (1993) revealed significant differences between eastern and western cuckoos in wing and tail length, bill length, and bill depth. These authors also pointed out geographic differences in behavior, ecology, and vocalizations, and thus concluded that the subspecific designations should stand.

Recent genetic analyses have provided conflicting results. Pruett et al. (2001) analyzed genomic DNA and found support (haplotype divergence) for the separation of western and eastern subspecies. However, unpublished mtDNA and cytochrome B analyses by Fleischer (2003) have suggested little substructuring among eastern and western cuckoo populations, and thus little genetic evidence for subspecific status. Thus, the systematic status of the two subspecies remains controversial and is clearly in need of a thorough revision.

Nominate race: *Coccyzus americanus* Linnaeus.

Distribution and abundance

Global perspective

Historically, yellow-billed cuckoos bred throughout most of continental North America, including portions of eastern and western Canada, northern and central Mexico, and the Greater Antilles. The species is now extirpated in western Canada, Washington, and Oregon, and rare and patchily distributed throughout most of the historical range in the United States west of the Rocky Mountains (**Figure 3**). The current distribution in the western United States is still difficult to delineate as cuckoos often wander before and after breeding (Hughes 1999). In the eastern United States and in eastern Canada, yellow-billed cuckoos are still a relatively common bird, but populations are declining in many areas (see the Population status section).

The decline in the western populations of yellow-billed cuckoos apparently began during the

Table 2. Selected management recommendations for yellow-billed cuckoos within state Partners in Flight Bird Conservation Plans.

State	Recommendations	Presumed benefits	Citation(s)
Wyoming	Maintain riparian cottonwood forests > 25 acres, 100 meters in width, with at least 2.5 acres of dense understory.	Maintain remaining high quality breeding habitat.	Cervoski et al. 2001
	Eliminate use of pesticides in breeding areas.	Increase prey abundance and decrease potential for build-up of toxins in cuckoos.	
Montana	Maintain low-elevation riparian woodland patches at least 16 ha (40 ac) in size with a 20-25% closed canopy.	Maintain remaining high quality breeding habitat.	Casey 2000
	Reduce pesticide use in breeding areas.	Increase prey abundance and decrease potential for build-up of toxins in cuckoos.	
Arizona	Eliminate grazing and off-road vehicle use in cottonwood-willow dominated habitats.	Improved habitat quality.	Latta et al. 1999
	Manage for large (>100 m wide), contiguous blocks of suitable breeding territory (riparian cottonwood/willow).	Improved habitat quality.	
	Maintain natural flow regimes in riverine/ riparian systems.	Improved habitat quality.	
	Limit or eliminate use of pesticides adjacent to riparian areas.	Increase prey density and decrease potential toxic effects in cuckoos.	
	Avoid intense and repeated human disturbances in nesting areas (from late May until late August).	Improve reproductive success.	
	Establish riparian corridors and habitat islands between breeding sites	Facilitate dispersal and recolonization.	
Utah	Establish a “no net loss” policy for riparian habitats.	Maintain current habitat availability.	Parrish et al. 2002
	Establish riparian stepping-stone habitat.	Decrease population fragmentation.	
	Restrict grazing and recreational activities within riparian zones.	Improve existing habitat quality/ decrease habitat degradation.	
	Maintain/improve natural flow regimes in riverine/riparian systems.	Improved habitat quality.	

early to mid-1900s, with birds disappearing in British Columbia by the 1920s (Campbell et al. 1990), in Washington by 1934, and in Oregon by 1945. Serious declines in California and Nevada were noticed in the 1940s and 1950s (see summary in Hughes 1999). In California, cuckoos are now largely restricted to river valleys in the north-central (e.g., Sacramento River) and southwestern (e.g., Kern River) regions (Laymon and Halterman 1987, Halterman et al. 2003). Surveys in these areas showed a decline from 1977 (122 to 163 pairs) to 1987 (31 to 42 pairs), and since about 1990, a stabilization to around 65 pairs (Halterman et al. 2003). There have been very few recent records in Nevada, with six, ten, and zero breeding pairs estimated during the breeding seasons of 2000 to 2002 in southern Nevada (Tomlinson and Halterman 2003). In Arizona, yellow-billed cuckoos occur largely in south-central and western areas of the state, with a maximum estimate of 425 birds statewide as of 1999 (Johnson 2003). There are very few historical breeding records in Utah, but recent surveying there suggests that there are a few breeding pairs at scattered locations, at least in non-drought years (Parrish et al. 2002).

Yellow-billed cuckoos winter in South America, primarily east of the Andes Mountains, but with small

Figure 3. Breeding range of yellow-billed cuckoos in North America. The figure is modified from Hughes (1999).

numbers (probably of the western subspecies) west of the Andes. The major wintering area appears to be south of the Amazon Basin, but smaller numbers of birds winter in Colombia, Venezuela, Suriname, Ecuador, Peru, and Bolivia. The southern limit of the wintering range is in northern Argentina, Uruguay, and Paraguay (Hughes 1999).

Regional distribution and abundance

Most historical works suggest that yellow-billed cuckoos were relatively common breeding birds within and near Region 2, at least on the central and eastern Great Plains. For example, the species was considered a common summer resident along wooded river valleys in Nebraska in the mid-1800s (Ducey 2000), and Goss (1886) considered it a common summer resident in Kansas. Cuckoos were obviously rarer to the west, as Sclater (1912) describes them as rare summer visitors in Colorado, largely on the eastern plains. Knight (1902) did not mention the species in his treatment of Wyoming birds, suggesting that they were rare in the state. More recent records within Region 2 suggest that yellow-billed cuckoos may have increased in the western Great Plains during the 1900s (i.e., eastern portions of Colorado and Wyoming). Across the Great Plains, damming of rivers and construction of impoundments has led to altered hydrology, with more stable flow patterns and more well-developed riparian woodlands. As a consequence, many species of birds have expanded their distribution westward along Great Plains river valleys (Rising 1983). This is probably especially true of yellow-billed cuckoos as they depend on well-developed riparian woodlands.

Currently, yellow-billed cuckoos are common breeding birds in eastern portions of Kansas, Nebraska, and South Dakota, but they become much scarcer to the west. In western Colorado and southwestern Wyoming, the *occidentalis* subspecies, which apparently was never common in those areas, appears to be disappearing. See **Figure 4** for a map of the breeding density in North American, based on Breeding Bird Survey abundance analyses (Sauer et al. 2004).

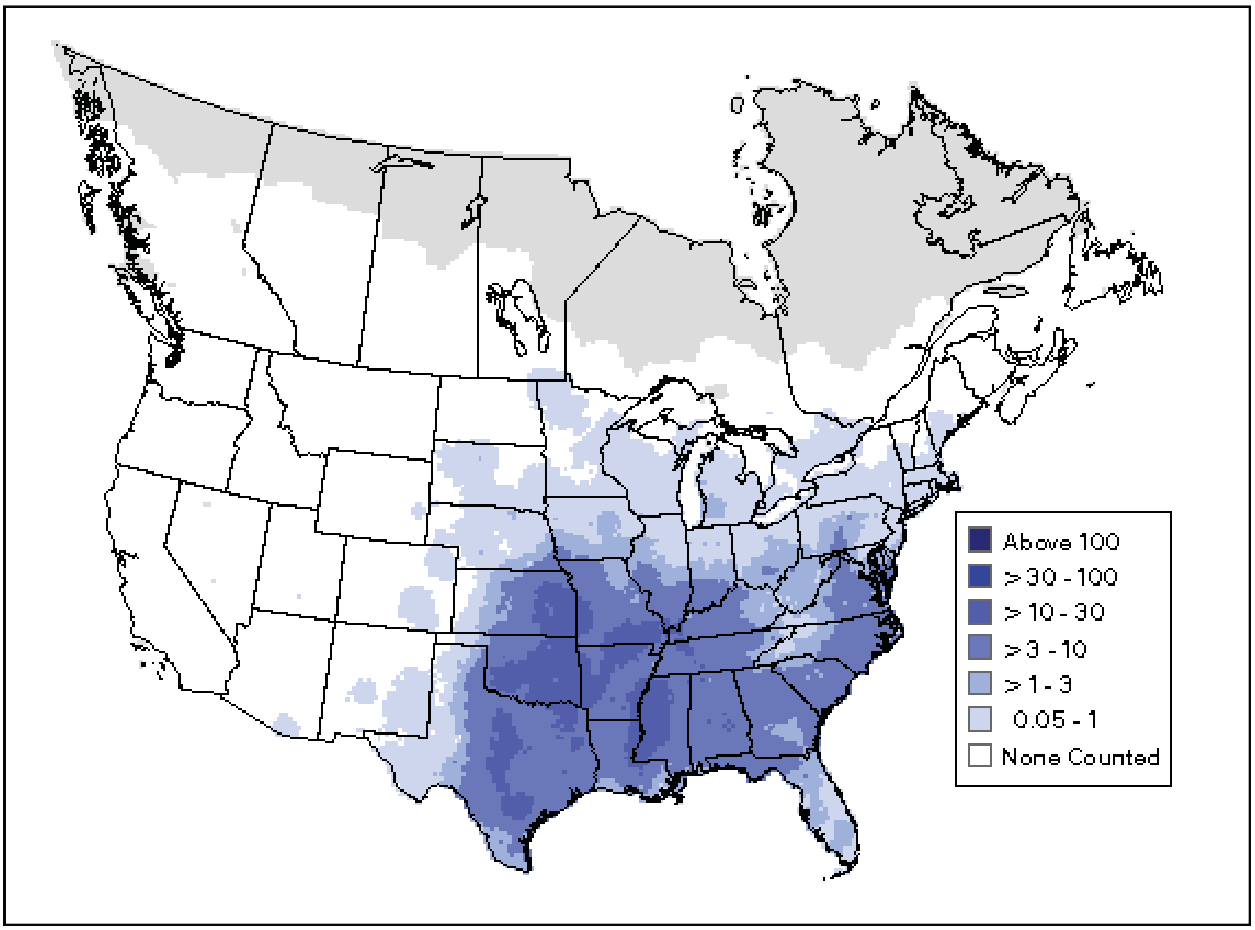

Figure 4. The mean number of yellow-billed cuckoos observed on Breeding Bird Surveys during the years 1982 to 2003 (data from Sauer et al. 2004).

The historical and current distributions and abundances in Region 2 are as follows:

South Dakota: Over and Thoms (1921) gave no indication of the abundance or distribution of yellow-billed cuckoos in South Dakota but mentioned only that they were "summer residents". Recent treatments suggest that yellow-billed cuckoos are relatively common in heavily wooded eastern portions of the state but become uncommon to rare breeders further west (Peterson 1995, Tallman et al. 2002).

Wyoming: The current and historical statuses of yellow-billed cuckoos in Wyoming are difficult to assess. Knight (1902) did not include the species in his discussion of Wyoming birds, suggesting that they were rare in the state in the late 1800s. Scott (1993) noted that they were regularly seen in the eastern half of the state during the summer months. Dorn and Dorn (1999) considered it a rare summer resident and showed scattered summer records throughout the eastern and southern portions of the state. **Figure 5** shows the distribution of summer records of yellow-billed cuckoos from the Wyoming Natural Heritage Database (Bennett and Keinath 2001). As mentioned earlier, it appears that cuckoos likely spread westward into eastern Wyoming following the construction of dams and impoundments on the Great Plains and the subsequent establishment of dense, riparian woodlands along affected rivers and streams.

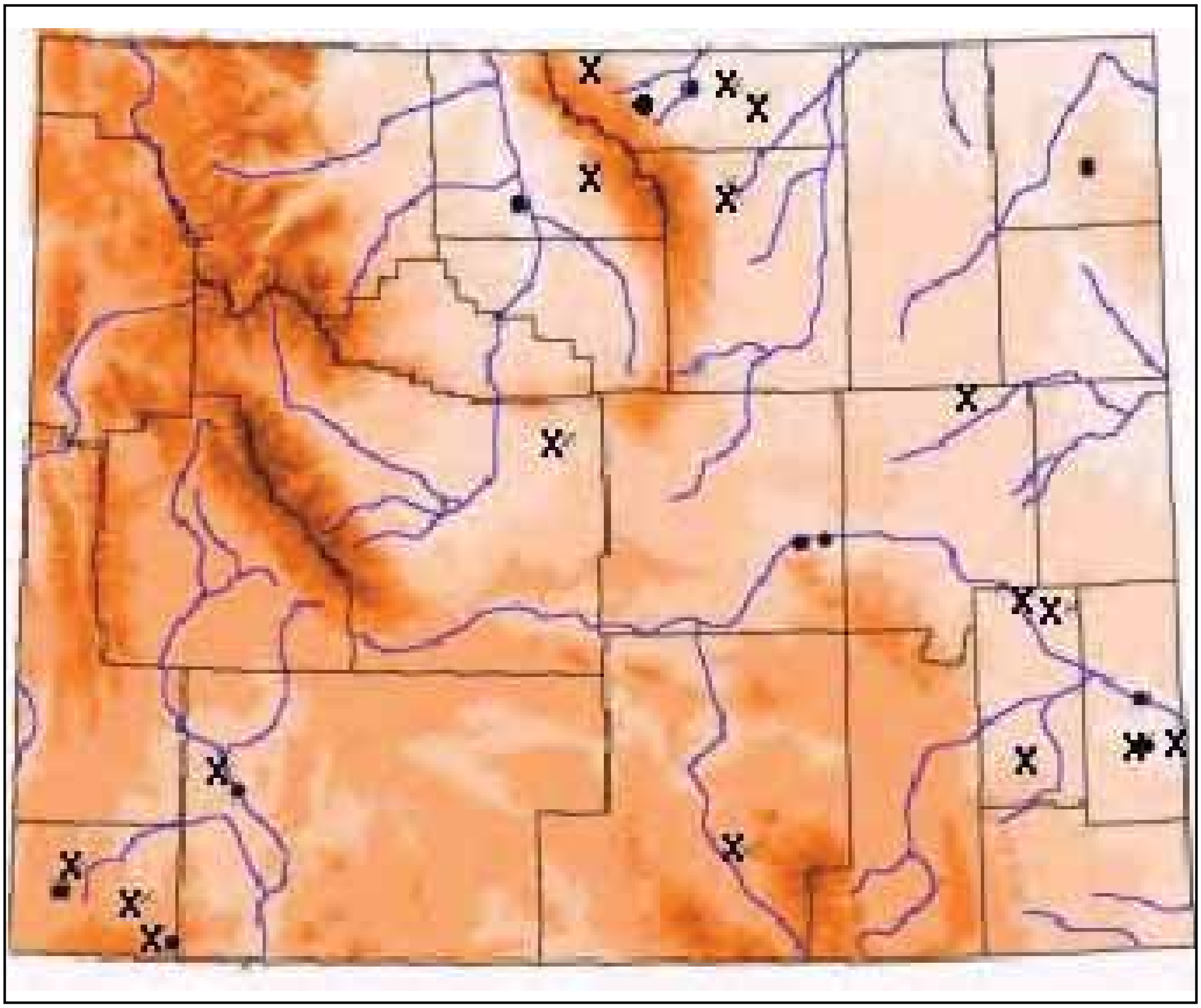

Figure 5. Wyoming Natural Heritage Program map of yellow-billed cuckoo records. Solid circles represent element occurrences (birds seen in suitable habitat during presumed nesting season), while X's represent sight records outside the presumed breeding period (from Bennett and Keinath 2001).

Nebraska: Recent (1984 to 1989) breeding bird atlas work in Nebraska found yellow-billed cuckoos to be widespread and fairly common, with the exception of the panhandle where only a few nesting pairs were found (Molhoff 2001). Sharpe et al. (2001) also described yellow-billed cuckoos as common in eastern Nebraska, while uncommon in the west, where they are confined to riparian areas. It is difficult to judge whether there has been a change in status in the state, but Hayden (1863) described yellow-billed cuckoos as quite common along river valleys in the northwestern part of the state, an area where they are now uncommon.

Colorado: In Colorado, yellow-billed cuckoos were historically noted as rare summer visitors, primarily on the eastern plains, but also in Middle Park and on the western slope at Grand Junction (Sclater 1912). Bailey and Niedrach (1965) considered yellow-billed cuckoos an uncommon summer resident, mainly on the eastern plains and into the Front Range, with a few breeding records from Grand County and one bird collected in Montezuma County. Thus, the few historical records suggest that the species apparently has always been rare in western Colorado, an opinion shared by Andrews and Righter (1992). Recent breeding bird atlas work in Colorado (Carter 1998) revealed only a single likely nesting record west of the continental divide over the five years of fieldwork. On the eastern plains, yellow-billed cuckoos are most often found along the Arkansas and South Platte River valleys, and in riparian areas in southwestern Baca and southeastern Las Animas counties (Andrews and Righter 1992, Carter 1998). The GAP map of modeled suitable habitat for yellow-billed cuckoos in Colorado is shown in **Figure 6**.

Kansas: Goss (1886) considered yellow-billed cuckoos to be common summer residents in Kansas but did not comment on their distribution. Thompson and Ely (1992) described them as common summer residents, statewide. The Kansas breeding bird atlas project (Busby and Zimmerman 2001) found a striking gradient in the abundance of yellow-billed cuckoos

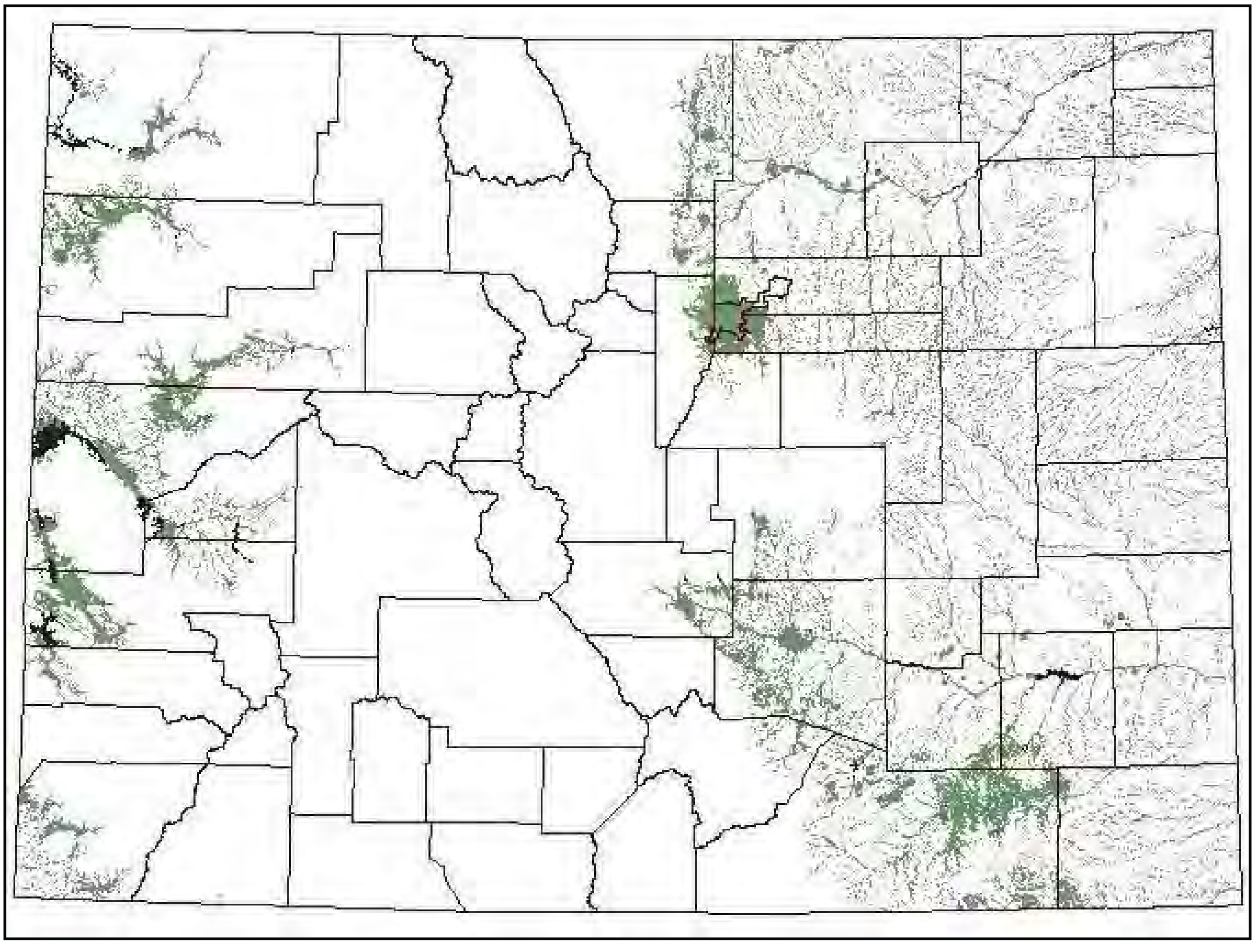

Figure 6. Modeled (GAP) potential suitable habitat for yellow-billed cuckoos in Colorado. Areas in dark green represent known breeding habitat while those in light green represent potential breeding habitat.

– they were abundant in eastern Kansas, but declined dramatically to the west and were very sparse on the High Plains area along the western border of the state.

Within Region 2, the distribution of yellow-billed cuckoos has not changed significantly since the 1800s, except in areas west of the continental divide. Although it appears that they were always rare in western Colorado and southwestern Wyoming, the lack of recent breeding records suggests that the species is now largely extirpated from those areas. There is some evidence that yellow-billed cuckoos became more common in eastern Colorado and eastern Wyoming following the stabilization of Great Plains rivers and the subsequent expansion of downstream riparian woodlands across the Great Plains.

Regional discontinuities in distribution and abundance

As a result of their dependence on low-elevation riparian woodlands, yellow-billed cuckoos have a relatively widespread but patchy distribution in Region 2. Cuckoo abundance is highest in southeastern Kansas and declines to the west and to the north (**Figure 4**). Currently, cuckoos appear to be extremely rare breeders in western Colorado (Carter 1998) and southwestern Wyoming (Bennett and Keinath 2001). They are also uncommon to rare in eastern Colorado, eastern Wyoming, and far western portions of Kansas, Nebraska, and South Dakota. In these latter areas, they are restricted to river valleys and relatively dense riparian habitat.

Population trend

Within Region 2, as well as throughout most of the eastern United States and Canada, cuckoos were common to abundant on Breeding Bird Surveys (BBS) from 1966 to 1979, increasing significantly during that period in many states (**Table 3**; Sauer et al. 2004). From 1980 onward, however, the opposite pattern was seen, with significant declines in abundance range-wide and particularly in the West where they are now extremely rare. Within Region 2, populations of yellow-billed cuckoos are now declining in all states, but the pace of those declines is difficult to judge as sample sizes become very small in western portions of the Region and small sample sizes limit the statistical power of the analyses. Oddly, the species may be much more common in Mexico than in the western United States. Russell and Monson (1998) describe the abundance of breeding yellow-billed cuckoos in Sonora as "truly imposing", relative to their abundance across the border in Arizona, and Wilbur (1987) reports yellow-billed cuckoos as "common" at San Bartolo, in the Cape District of southern Baja California.

Table 3. Yellow-billed cuckoo trend results from North American Breeding Bird Surveys. Data were taken from Sauer et al. (2004) and focus on USDA Forest Service Region 2 states (bolded) and surrounding areas. Trend indicates the percentage change per year. Statistically significant (P <0.05) trends are underlined.

	1966-1979			**1980-2003**			**1966-2003**		
Region	***N***	**Trend**	***P***	***N***	**Trend**	***P***	***N***	**Trend**	***P***
South Dakota	7	15.1	**0.00**	10	- 18.9	**0.04**	18	- 6.2	0.10
Nebraska	22	20.1	**0.02**	29	- 6.5	**0.04**	35	- 3.3	0.18
Wyoming	—	—	—	—	—	—	—	—	—
Colorado	—	—	—	4	- 21.3	0.12	5	10.4	0.76
Kansas	33	4.8	**0.01**	48	- 2.9	**0.00**	48	- 0.9	0.06
Oklahoma	32	2.4	0.11	56	- 1.5	**0.02**	57	- 1.2	**0.00**
New Mexico	—	—	—	7	- 3.8	0.51	9	- 8.7	0.15
Arizona	—	—	—	2	15.9	0.29	3	14.0	0.19
Iowa	31	0.9	0.80	31	- 3.5	0.10	34	- 4.9	0.06
Missouri	37	5.6	**0.00**	61	- 3.4	**0.00**	63	- 1.9	**0.00**
U.S. Fish and Wildlife Service Region 6	65	5.9	**0.00**	91	- 3.3	**0.00**	109	- 1.0	**0.02**
United States	1070	3.4	**0.00**	1651	- 2.4	**0.00**	1770	- 1.8	**0.00**
Canada	19	14.8	**0.00**	25	- 1.8	0.61	34	0.4	0.80
Survey-wide	1089	3.4	**0.00**	1676	- 2.4	**0.00**	1826	- 1.8	**0.00**

There are virtually no data available on the population status of yellow-billed cuckoos on their South American wintering grounds. The possibility exists that conditions there are either driving or (more likely) contributing to the population declines seen in North America.

Activity pattern and movements

Yellow-billed cuckoos are one of the latest neotropical migrants to arrive on their North American breeding grounds. On the Great Plains they typically begin to arrive in late May and continue into June (**Table 4**). Arrival times in western Colorado and southwestern Wyoming are difficult to judge as there are few data from those areas, but Andrews and Righter (1992) give similar dates (late May to June) for eastern Colorado populations. Great Plains and Rocky Mountain populations begin fall migration in August, with most birds gone by late September or (in Kansas) early October.

The extent to which yellow-billed cuckoo populations on the Great Plains are linked is unclear. However, given the apparent lack of breeding site fidelity in the eastern United States (Gaines and Laymon 1984, Hughes 1999), it is likely that there is considerable gene flow among neighboring populations. The same situation likely exists west of the continental divide, where juvenile female cuckoos may disperse widely (Laymon 1998). In California, females banded as nestlings are only rarely resighted as adults, suggesting that females show little to no natal philopatry. However, breeding pairs do show site fidelity in the Kern River area (Laymon 1998). Aside from data originating from the Kern River area in California, there are few estimates of natal philopatry and virtually no data on adult or juvenile survival, as banded yellow-billed cuckoos are rarely recaptured (e.g., only 26 recoveries of 6657 banded cuckoos; Hughes 1999).

Habitat

Nesting habitat

Yellow-billed cuckoos prefer to nest in open woodlands with an understory of dense vegetation, especially near water. On the Great Plains, the favored nesting habitats are well-wooded river valleys and associated deciduous forests. In the desert Southwest, nesting habitat is invariably riparian woodlands, particularly those with an intact (i.e., ungrazed) understory. They also occasionally nest in orchards and other riparian-associated woodlands.

Cuckoo nests are typically placed in dense patches of broad-leaved deciduous trees, usually with a relatively thick understory (Hughes 1999). From the eastern Great Plains eastward, nests are often placed in oak (*Quercus* spp.), beech (*Fagus* spp.), elm (*Ulmus* spp.), dogwood (*Cornus* spp.), hawthorn (*Crataegus* spp.), ash (*Fraxinus* spp.), and several other broad-leaved deciduous species (Hughes 1999). In western portions of the range, nests are often situated close to water, likely because of the lack of dense vegetation away from water. Western cuckoos (including those in the western Great Plains) prefer to nest in willow (*Salix* spp.), cottonwood (*Populus* spp.), and mesquite (*Prosopis* spp.), but they will also utilize orchards (Laymon 1980, Walters 1983). On the Kern River in California, 95 of 96 nests were found in willows (Laymon 1998). Conifers are not often used in the East or West (Hughes 1999). Recent studies in Arizona have found cuckoos nesting (successfully) in mesquite and hackberry (*Celtis occidentalis*), occasionally some distance away from waterways, but the extent to which they do so in other areas, or even in all years, is unknown (Halterman 2003).

In western portions of Region 2, most recent summer cuckoo sightings have been made along river

Table 4. Timing of yellow-billed cuckoo spring arrival and fall departure dates within USDA Forest Service Region 2 states.

Area	Spring arrival date	Fall departure date	Source
South Dakota	mid- to late May	August to September	Tallman et al. 2002
Wyoming	late May	August to September	Dorn and Dorn 1999
Nebraska	mid-May (southeast) to early June (northwest)	September	Sharpe et at. 2001
Colorado	late May to June	September (eastern population) August (western population)	Andrews and Righter 1992
Kansas	early May	early October	Thompson and Ely 1992

valleys, including the Gunnison, Colorado, and Yampa rivers in Colorado (Andrews and Righter 1992) and the Green River in Wyoming (Wyoming GAP analysis web site: www.wygisc.uwyo.edu/wbn/). A similar pattern occurs further west in Utah, Arizona, and California, where most remaining nesting areas are remnant deciduous forest patches along large river courses. Nesting habitat has been particularly well documented in California. In most areas of California (excluding the Colorado River; Laymon and Halterman 1989), preferred nesting sites are areas with:

- at least 15 ha of deciduous, riparian forest
- at least 3 ha of closed canopy
- a canopy height of 5 to 30 m
- a vegetation understory averaging 1 to 6 m in height.

In California, Laymon (1998) noted a statistically significant, positive relationship between habitat patch size and occupancy by cuckoos. Thus, although yellow-billed cuckoos have been found breeding in patch sizes as small as 4 ha along the Colorado River in southern California, the typical patch size is 20 ha or greater, and the likelihood of occupancy increases dramatically with increasing patch size.

Foraging habitat

Cuckoo foraging habitat is similar to that used for nesting. Foraging areas during the breeding season averaged 19.6 ha in California (Laymon 1980), but foraging habitat has not been quantified in eastern portions of the range. It is likely that a healthy forest understory is a critical component of cuckoo foraging areas, as most nests are placed in or near such areas. The only detailed observations of cuckoo foraging behavior (from California) found that most attempts at prey capture occurred at heights greater than 3 m (Laymon 1980). Overall, 55 percent of all prey items in California were taken in riparian vegetation, 33 percent from white alder (*Alnus rhombifolea*) tracts, and 12 percent from orchards (Laymon 1980). Hughes (1999) noted that cuckoos often foraged in upland areas away from riparian woodlands, especially prior to nesting.

Food habits

Yellow-billed cuckoos feed primarily on slow-moving insects, including Orthopterans (grasshoppers, crickets, katydids), Lepidoptera (primarily caterpillars), and various bugs (Hemiptera) and beetles (Coleoptera). Beal (1898) studied yellow-billed cuckoo stomach contents from across the range and found a relatively uniform diet consisting of caterpillars (49 percent), Orthoptera (30 percent), and various other insects (18 percent). In a sample of stomach contents from Nebraska, Bent (1940) found that 73 percent of the total prey mass was made up of Orthopterans. Larvae of the family Sphingidae (sphinx moths; Lepidoptera) have been noted as an important food source for yellow-billed cuckoos, and the lack of such prey has been implicated in the decline of the western subspecies. In a detailed study of over 2400 food items brought to nests on the Kern River in California, Laymon (1998) found 45 percent green caterpillars (primarily sphinx moth larvae), 24 percent tree frogs, 22 percent katydids, and 9 percent grasshoppers. In eastern North America, periodical cicadas (*Magicicada* spp.) can form an extremely important component of the diet in years when they are abundant (Nolan and Thompson 1975). Yellow-billed cuckoos may also consume arboreal frogs and lizards (Voous 1955, Hamilton and Hamilton 1965) as well as bird eggs and even small nestlings (Beal 1898).

The percentage of some prey types appears to change seasonally as they become more available. For example, Laymon (1980) found that the percentage of katydids in the diet of cuckoos in southern California rose from 7 percent in the early summer to 40 percent by mid-summer to 70 percent in late summer. In late summer and early fall, as well as on the wintering grounds, cuckoos also consume wild fruits (Bent 1940, Haverschmidt and Mees 1994).

There have been no published studies of cuckoo food habits within Region 2, and this lack of information represents a critical gap in our ability to successfully manage regional cuckoo populations (see Information Needs section).

Breeding biology

Despite the species' abundance in eastern North America, the breeding biology of yellow-billed cuckoos has received relatively little study, likely due to their shy habits during the breeding season. The only detailed studies have been carried out in the eastern portion of the range (Preble 1957, Nolan and Thompson 1975, Potter 1980, 1981). There has been considerable recent research on the threatened western yellow-billed cuckoo populations, but much of that work has been concerned with identifying remaining habitat patches, assessing habitat suitability, and surveying for breeding cuckoos. Thus, aside from the work of Hamilton and

Hamilton (1965) and Laymon (1980), there has been little published on the breeding biology of western cuckoo populations.

Courtship and pair formation

The period of courtship and pair formation has not been well-studied in yellow-billed cuckoos. Pairs begin forming soon after their arrival on the breeding grounds, from May to June in the eastern portion of the range and from June to early July in the West (Hughes 1999). While following a female during courtship and when soliciting copulations, males will carry a food item that they then typically offer to the female during copulation (Hendricks 1975, Laymon 1998). Members of a pair visit prospective nest sites together before finally choosing one (Hamilton and Hamilton 1965). Both male and female cuckoos contribute to building the nest, gathering material (mostly twigs) from the immediate area around the nest site (Hughes 1999).

Clutch and brood size

Clutch size varies from one to five eggs, with a mean of two to three (Potter 1980). Johnsgard (1979) reported a mean clutch size of 3.1 eggs in Kansas. On the Kern River in California, clutch size averaged 2.95 (n = 92 clutches) with a modal clutch size of three and a range of one to six eggs (the latter laid by two females in one nest; Laymon 1998). On the Bill Williams River in Arizona, Halterman (cited in Laymon 1998) found a mean clutch size (n = 14) of 2.14 eggs (with no four or five egg clutches). Although there have been occasional reports of larger clutches, they are considered to be cases where two or more females laid eggs in the same nest (Nolan and Thompson 1975). Female cuckoos lay exceptionally large for their body size eggs for their body size, and the laying interval is typically every other day (Hughes 1999).

Yellow-billed cuckoos are also known to be both intra- and interspecific brood parasites, laying their eggs in other cuckoo nests and also in the nests of at least eleven other bird species (Fleischer et al. 1985, Hughes 1997, 1999). The frequency with which they engage in such behavior is not well known, but only 1 of 92 nests in California had eggs deposited by more than one female (Laymon 1998). In eastern populations, intraspecific brood parasitism appears to be more frequent during years of high food abundance (e.g., cicada emergences; Nolan and Thompson 1975, Fleischer et al. 1985). The extent to which females engage in brood parasitism is in need of further study (see Information Needs section).

Parental care and offspring behavior

Yellow-billed cuckoos are typically monogamous, but Laymon (1998) documented helper males at about 30 percent of nests in a California study. It is not clear whether the helper males are related to the breeders, which is typically the case in species with helpers at the nest (Stacey and Koenig 1990). Helpers provide food to the nestlings, and this may account for more than 40 percent of the total food deliveries (Laymon 1998).

Both cuckoo parents incubate the eggs, sharing the duties equally during the day, with the male typically incubating during the night (Preble 1957, Hamilton and Hamilton 1965, Hughes 1999). Parents relieve each other during incubation approximately every 1 to 2 hours during the day. The incubation period is unusually short, lasting 9 to 12 days (Hamilton and Hamilton 1965, Potter 1980, Laymon 1998), with an average of 11 to 12 days on the Kern River in California (Laymon 1998). During the incubation and early nestling stages, nests are rarely left unattended (Laymon 1998). Both parents brood the young, particularly during cool periods, with the male brooding the young at night (Preble 1957, Potter 1980). Parents cease brooding the young once the feathers have broken their sheaths, typically at around 6 days of age.

The nestlings are fed by both parents, but within some pairs only one of the parents may provide the vast majority of the food (Hughes 1999). In California, female cuckoos may stop tending the brood early in the nestling stage and start another nest (Laymon 1998). In such cases, the male takes over all of the nestling care in the first nest and also assists the female with the care of the second brood. The nestling feeding rate increases from about 15 times per day when the young are 2 to 3 days old, to 31 times per day when the young are 5 to 6 days old (Preble 1957). The last-hatched young is typically fed less often than its nest mates, and it may even be removed from the nest by the parent if food is limiting (Laymon 1980). Once the young have fledged (at 5 to 8 days of age, mean of 6 days in California; Laymon 1998), parents continue to feed the young, who hide in the immediate vicinity of the nest. Parental care from this point on has not been studied.

Nestling growth

Nestlings hatch relatively well-developed, with the ability to open their eyes and stand within 24 to 36 hours. This appears to be a result of the exceptionally large eggs (mean 9.1 to 9.4 grams) that cuckoos lay, given their body size (Nolan and Thompson 1975). Yellow-billed cuckoo nestlings have one of the fastest growth rates among altricial birds, hatching at 8 to 9 grams and fledging 7 to 9 days later at 32 to 38 grams (Preble 1957, Hamilton and Hamilton 1965, Potter 1980). Such rapid nestling growth is typical of brood parasites, whose young must grow more rapidly than host young (Lack 1968). Young "fledge" well before they can fly (at around 21 days; Hughes 1999) by creeping along tree branches and hiding in vegetation. At 10 days of age, the fledglings are capable of flying about 20 meters, and by day 14, they can sustain flight for over 100 m (Laymon 1998).

Timing of breeding and breeding success

Table 5 provides a summary of the timing of major reproductive events for yellow-billed cuckoos in Region 2. As is the pattern for many other species of birds, cuckoos breed earliest in the southern and eastern portions of Region 2, with clutch initiations coming later in the north and to the west. Some authors have suggested that yellow-billed cuckoos may raise two broods per year, at least in some southeastern states (e.g., Sutton 1967). On the Kern River in California, Laymon (1998) has documented many cases of successful double-brooding and even one case of successful triple-brooding. While double-brooding is not rare on the Kern River, it typically occurs only in years with plentiful food resources (Laymon 1998). In the 12 years of study summarized by Laymon (1998), instances of double-brooding occurred in five years. Further east in Arizona, Halterman (cited in Laymon 1998) found no evidence of double-brooding on the Bill Williams River. In the central and eastern portions of the United States, occasional double-brooding may account for some of the exceptionally late nesting records that have been observed: nests with eggs have been found in Kansas on 10 September (Johnston 1965), in South Dakota on 12 September (Tallman et al. 2002), and a recently fledged young was found in Oklahoma (just south of Region 2) on 2 October (Baumgartner and Baumgartner 1992).

In the Sacramento Valley of California, only 64 percent of eggs hatched at four nests (Laymon 1980), while only 60 percent of (15) eggs hatched in seven Indiana nests (Nolan 1963). Fledging success (percent of hatchlings that successfully left the nest) in the same studies was reported as 43 percent in California and 22 percent in Indiana. More recent work on the Kern River in California has documented better breeding success, with 87 percent of all eggs hatching, 74 percent of all eggs producing fledged young, and a mean of 2.14 young fledged per nest (Laymon 1998). For females that produce multiple broods in a year, a mean of 2.56 young are fledged per year. In Arizona, Halterman (cited in Laymon 1998) found that 67 percent of 27 eggs (in 12 nests) resulted in fledged young.

The reasons for the low hatching and fledging success observed in some studies is unclear but warrants further study. The available evidence suggests that the local abundance of invertebrate prey has a strong effect on nesting success (Laymon 1980, 1998, Hughes 1999), and pairs may even forgo breeding in years with inadequate food supplies (Veit and Petersen 1993). In addition, investigator disturbance may have caused poor reproductive success in some studies as yellow-billed cuckoos often desert the nest if it is disturbed during nest-building or incubation (Laymon 1998). As a consequence, researchers should take particular care to avoid visiting nests until after the young hatch, when parents are much less likely to abandon the nest.

Demography

Genetic characteristics and concerns

Yellow-billed cuckoos are relatively widely distributed and common in eastern North America, occurring in most low-elevation, deciduous forests. West of the continental divide, however, they are now found only in highly disjunct patches of suitable habitat. The highly fragmented nature of their distribution in the West is likely contributing to the species' decline in those areas as western populations are now isolated

Table 5. Peak timing of major breeding events for yellow-billed cuckoos in USDA Forest Service Region 2.

Study area	First clutch date	Hatch date	Fledge date	Citation
Kansas	5 June (11 May to 10 September)	mid June	late June	Johnston 1964
Colorado	(east) mid July (west) early July	late July mid July	early August late July	Andrews and Righter 1992
Nebraska	mid June	late June	early July	Molhoff 2001, Sharpe et al. 2001
South Dakota	late June	early July	mid July	Tallman et al. 2002

and may be negatively affected by a (relative) lack of immigration. The extent to which inbreeding is now occurring in western populations is not known. In the eastern portions of the range, there may be considerable gene flow among neighboring areas due to the dispersal tendencies of juvenile cuckoos, as well as the species' relative abundance. On the Great Plains, where cuckoos are largely confined to riparian areas (especially in the arid western plains), populations may be more genetically isolated as cuckoos decline in abundance. However, it is important to note that with the expansion of riparian woodlands along some Great Plains rivers, these waterways are likely to act as dispersal corridors for cuckoos and thus may assist in maintaining gene flow among populations on the Great Plains.

Life history characteristics

There are major gaps in our knowledge of yellow-billed cuckoo life history characteristics. Yellow-billed cuckoos lay small clutches and in most years, produce only a single clutch. Reproductive potential is, therefore, relatively low. Individuals are thought to breed first as one-year olds (Hughes 1999), but in western populations at least, there are records of floaters as well as helper males at nests (Laymon 1998, Hughes 1999). There are no available data on post-fledging or adult survival. In addition, dispersal behavior is very poorly understood, as few banded birds have ever been recovered. One recent resighting of a banded cuckoo in Arizona showed that an adult had moved from the San Pedro River area in the southeast to the Bill Williams River area in the northwest, a distance of several hundred miles (Halterman 2003). Given the lack of critical life history data, analyses of life cycle diagrams and associated demographic matrices (Caswell 1989, McDonald and Caswell 1993) were not carried out in this review. While such analyses can provide valuable insights into which life-history stages may be most critical to population growth, constructing models based on incomplete and/or poor quality data may have little relevance (Reed et al. 2002).

There have been recent attempts to measure life history characteristics within some of the western populations of cuckoos (e.g., Halterman 2003), but these have apparently been hampered by difficulties in capturing adult cuckoos and by the overall small sample sizes that are now inherent in any study of the western subspecies.

Social patterns and spacing

Little information is available on territorial and social behaviors of cuckoos. There are anecdotal observations of chases during the breeding season (Hamilton and Hamilton 1965), but in California at least, there appears to be little territoriality, with neighboring pairs often utilizing overlapping habitat with little sign of conflict (Laymon 1980). Laymon (1998) reported territory sizes ranging from 8 to 40 ha (20 to 100 acres) on the Kern River, California. On the Colorado River, territory size is thought to average smaller, as pairs often occupy woodland patches as small as 4 ha (10 acres; Laymon and Halterman 1989).

Cuckoos appear to be solitary during the breeding season, but occasionally several adults have been seen tending nests (Hughes 1999), suggesting that cooperative breeding may occur on occasion. Laymon (1998) reported that about 30 percent of nests on the Kern River in California were tended by a helper male. During migration and on the wintering grounds, cuckoos have been seen in small groups and (occasionally) in large aggregations in Central and South America (Wetmore 1968, Hilty and Brown 1986, Stiles and Skutch 1989), suggesting that migrating birds may form loose flocks.

Factors limiting population growth

West of the continental divide, yellow-billed cuckoos occur at extremely low abundance and at widely scattered locations. The rarity of cuckoos in the West may lead to a number of problems affecting population viability. For example, the relatively high rate of helping behavior by unpaired males in California may be a result of the species' rarity and a lack of breeding females. However, careful observations of breeding behavior in the eastern portion of the range are needed to determine whether helping behavior is a normal aspect of the species' life history. Even when suitable breeding habitat becomes available, the overall rarity of yellow-billed cuckoos may preclude immigration to such sites.

In the western portion of the range, loss and/or degradation of breeding habitat is the factor most often cited as driving the declines in yellow-billed cuckoos. Aside from simply reducing the available amount of suitable breeding habitat, degradation of riparian habitats may lead to a number of other negative effects: a reduction in the local food supply, an increase in predation at nests, and a lack of suitable dispersal areas for adult and juvenile cuckoos. Pesticide application is another factors noted as a problem for yellow-billed cuckoos (Hughes 1999). In California, Laymon (1980, 1998) reported that yellow-billed cuckoos eggs contained traces (0.08 and 0.11 ppm) of DDE and that egg shells collected in 1985 averaged 19 percent thinner than those collected prior to widespread DDT applications. In addition, various pesticides used to control mosquitoes and fruit pests (e.g., Zolone) have been observed to correlate with subsequent abandonment of breeding areas by cuckoos, as well as deleterious effects (e.g., loss of motor-control) on juvenile cuckoos (Laymon 1998).

Within Region 2, the factors driving the declines in yellow-billed cuckoo abundance are not yet clear. In western portions of Colorado and Wyoming, loss of undisturbed riparian habitats is the most likely factor limiting cuckoo population growth. The same factor may be important on the western Great Plains (i.e., eastern Colorado, eastern Wyoming, and extreme western portions of South Dakota, Nebraska, and Kansas), where cuckoos are largely restricted to breeding along riparian strips in otherwise arid areas. Further east, yellow-billed cuckoos are also declining, but not as rapidly as in the West. The near range-wide declines, even in eastern North America, suggest that a further factor may be contributing to the declines. It is possible that the widespread habitat loss on the wintering grounds (e.g., Morton 1992, Nepstad et al. 1999), together with the more frequent use of pesticides and herbicides there, have combined to significantly reduce over-winter survival. However, given the near total lack of information on the biology of cuckoos on their wintering grounds, it is not currently possible to assess whether such effects are in fact contributing to declines in cuckoo abundance.

Community ecology

Interactions between yellow-billed cuckoos and their predators, and how these factors interact with habitat use, are presented in **Figure 7**. There is currently a better understanding of community interactions in the western portions of the range, where overgrazing by cattle appears to have had a significant negative impact on preferred habitat. In addition, alteration of natural flow regimes and direct destruction of riparian woodland areas are thought to be major contributors to the rapid decline in available breeding habitat for western yellow-billed cuckoos (Laymon and Halterman 1989).

Predation of eggs and young, and possibly adults, at nests is relatively common, with up to 80 percent of nests in some areas failing to fledge young (Nolan 1963, Nolan and Thompson 1975). Predators known to take cuckoo eggs and young include blue jays (*Cyanocitta cristata*; Potter 1980) and common grackles (*Quiscalus quiscula*; Nolan and Thompson 1975), and indirect evidence implicates snakes and mammals (Nolan 1963). During migration, adults are apparently susceptible to predation by raptors (e.g., aplomado falcons (*Falco femoralis*); Hector 1985).

Hughes (1999) listed a number of species, including American robins (*Turdus migratorius*), gray catbirds (*Dumatella carolinensis*), and wood thrushes (*Hylocichla mustelina*), that will mob yellow-billed cuckoos, apparently in response to the threat of brood parasitism.

The parasites affecting yellow-billed cuckoos have not been well studied. Greiner et al. (1975) found five of 16 cuckoos infected with Leucocytozoon, Trypanosoma, and Microfilaria blood parasites. However, whether these and other parasites (see Hughes 1999 for a brief review) have significant effects on cuckoos remains unknown.

CONSERVATION

Threats

Yellow-billed cuckoo abundance has declined in most areas within Region 2, especially in western Colorado and Wyoming. The threats to yellow-billed cuckoos likely vary according to region (west of the continental divide, western Great Plains, eastern Great Plains), with habitat loss and fragmentation being particularly important in the western (arid) portions of Region 2. Habitat fragmentation may be an increasingly serious problem for cuckoo populations on the western Great Plains, whereas further east, a combination of habitat fragmentation, and other, unknown factors appear to be driving the decline (Hughes 1999). Specific threats to yellow-billed cuckoos are discussed individually below.

Pesticides

A number of authors have cited ingestion and toxicity of pesticides as a problem for cuckoos. Jauvin (1996) suggested that local declines in cuckoo populations in Quebec may have been related to large-scale control programs aimed at tent caterpillars. During the 1950s and 1960s, when DDT use was widespread,

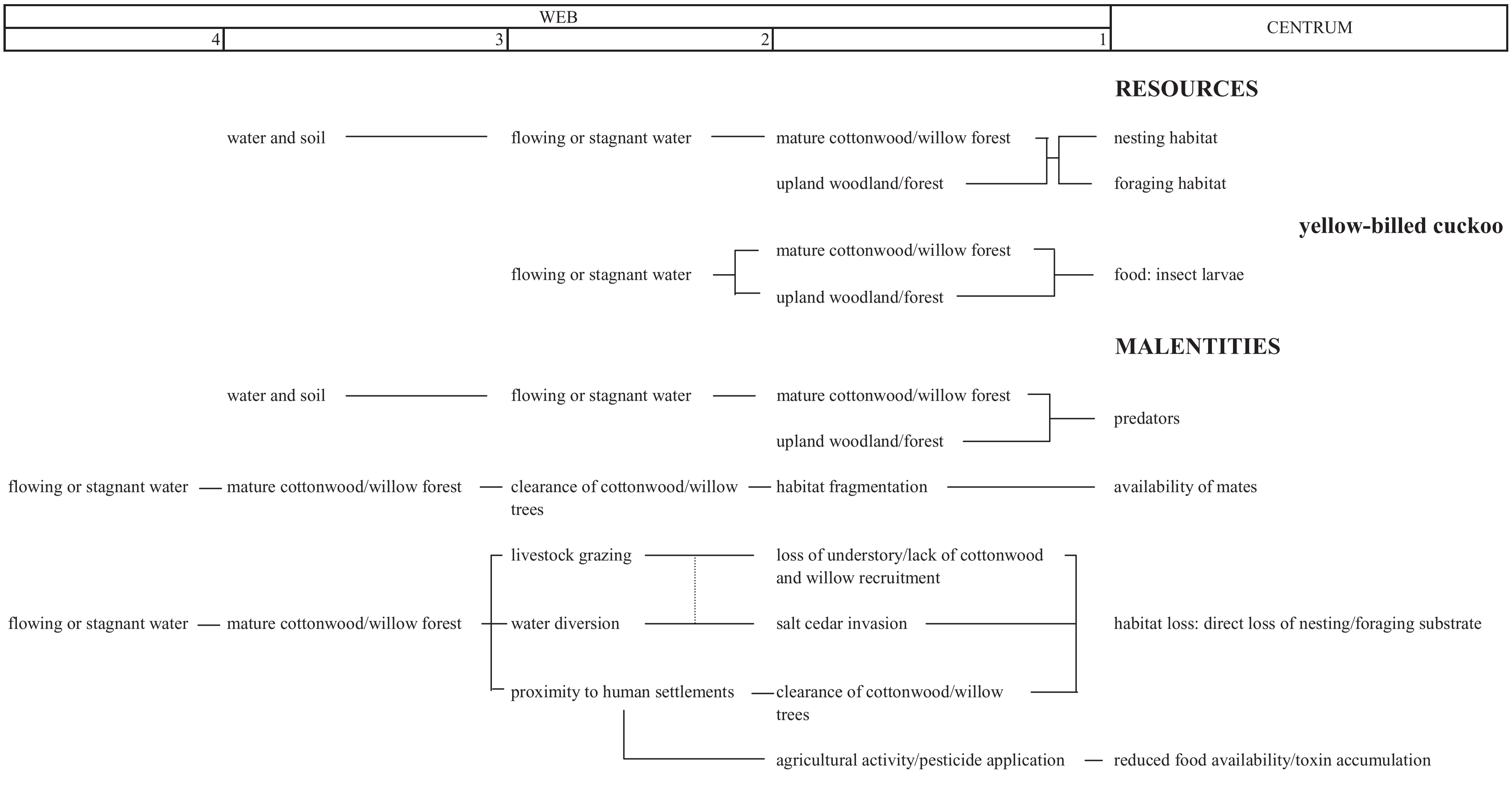

Figure 7. Envirogram representing the web of linkages between yellow-billed cuckoos and the ecosystem in which they occur. These linkages apply to all cuckoo populations in USDA Forest Service Region 2, but are particularly focused on populations within relatively arid landscapes, including all of Colorado and Wyoming, as well as western portions of South Dakota, Nebraska, and Kansas.

there were several reports of significant accumulation of toxins in body tissues (Grocki and Johnston 1974), in eggs (Laymon 1980, Laymon and Halterman 1987), and even direct mortality of adult cuckoos following DDT applications to foliage (Wallace et al. 1961). While DDT and DDE are no longer widely used in North America, they are still sold in Central and South America, and thus toxin accumulation from these and other pesticides/herbicides may remain a significant problem during migration and on the wintering grounds. In California, spraying of larvicides and other pesticides (for mosquito control and in orchards) has been cited as a continuing problem for yellow-billed cuckoos (Laymon 1998).

Aside from the negative effects of toxin accumulation in cuckoo body tissues, pesticide use can significantly reduce prey abundance, thus lowering cuckoo reproductive success. Although there have been no experimental studies linking local pesticide applications with cuckoo reproductive success, cuckoo population declines have been noted in areas (e.g., central valley of California) where heavy pesticide use is common in agricultural areas bordering riparian zones (Laymon and Halterman 1989).

Habitat loss

There have been a number of studies in the western United States that have assessed habitat availability for yellow-billed cuckoos, and without exception, they have shown drastic declines in riparian habitat extent and/or quality. Laymon and Halterman (1987) found that habitat structure is often altered, from cottonwood-willow forest to saltcedar (*Tamarix* spp.), with a concurrent reduction in or elimination of the local cuckoo population.

Alteration of hydrology, due to dam construction or irrigation schemes, may both positively and negatively affect yellow-billed cuckoos. Dam construction typically results in single channel, deep waterways that allow the development of relatively dense riparian woodlands. While such vegetation may help to create long corridors of suitable habitat and thus promote the dispersal of cuckoos, much of the normal floodplain vegetation may be lost. Laymon (1998) noted that meandering riparian systems were important yellow-billed cuckoo habitat in California as such systems provided young riparian habitat that are key resources for cuckoos. Relative to mature riparian woodlands, young woodlands provide preferred nesting sites, high productivity of invertebrate prey, and reduced predator abundance (Laymon 1998). Heavy draw for irrigation purposes may seriously decrease water flows and impair associated riparian vegetation, especially in arid southwestern North America. Releases of large quantities of water from dams may also threaten riparian vegetation. Groschupf (1987) analyzed vegetation along one waterway in Arizona that was exposed to repeated, large releases of water from a dam. Almost all cottonwoods and over half of all willow trees were eliminated, resulting in a reduction from 13 cuckoos per 40 ha before the flooding to 3 cuckoos per 40 ha after the flooding.

Yellow-billed cuckoos apparently depend on large tracts of forest, especially in the western portions of their range. In California, cuckoos prefer to nest in areas with at least 10 ha of contiguous (riparian) woodland (Laymon 1998), but they will nest in smaller patches when habitat is otherwise limited (Laymon and Halterman 1989). Further east, cuckoos have been found breeding in 22 ha woodland fragments in Mississippi (Hughes 1999), but were absent from Florida woodlands that were less than 7.5 ha (Bancroft et al. 1995).

A summary of the loss of low-elevation, riparian cottonwood forest in several western states suggests that the problem of habitat loss is widespread and severe. Estimates range from 90 to 99 percent in California, 90 to 95 percent in Arizona, to 90 percent in New Mexico (Groschupf 1987, Rosenberg et al. 1991). Such a loss of riparian habitat leads not only to a direct reduction in cuckoo numbers but also leaves a highly fragmented landscape, which often reduces breeding success by increasing predation rates and decreasing the ease of dispersal by juvenile and adult cuckoos.

Grazing effects

Livestock grazing is typically cited as a major contributor to the degradation of yellow-billed cuckoo habitat in the western portions of the range. Grazing has a significant impact on understory vegetation, retarding or eliminating new growth in riparian areas and thereby severely hampering recruitment of woody species. Bock et al. (1993) found that a large number of southwestern riparian bird species were negatively affected by livestock grazing. Kreuper et al. (2001) showed that the response of southwestern riparian corridors to the elimination of livestock grazing can be dramatic, restoring a vibrant understory to riparian woodland and increasing the local breeding population of yellow-billed cuckoos (San Pedro River in Arizona). Although longer-term studies are lacking, it is likely that eliminating livestock grazing will also significantly impact regeneration of riparian woodland by increasing the recruitment probabilities of young trees. Finally, grazing may promote the establishment of exotic saltcedar by eliminating competition from native cottonwood and willow saplings, which are preferred forage for livestock. The precise microhabitats favored by yellow-billed cuckoos (relatively cool, damp, and shady areas) are those favored by livestock, suggesting that the effects of grazing are likely particularly heavy on cuckoos, relative to other riparian species.

Environmental factors

One of the primary sources of population regulation in yellow-billed cuckoos appears to be the occurrence of periodic insect population irruptions (Veit and Petersen 1993). There are several cases of significant local increases in the number of breeding cuckoos during years of tent caterpillar (Michigan, Eastman 1991; Colorado, see Colorado summary in https://ecos.fws.gov/species_profile/SpeciesProfile?spcode=B06R) or cicada (Indiana, Nolan and Thompson 1975; Kansas, Fleischer et al. 1985) outbreaks. The opposite pattern may also occur. Jauvin (1996) suggested that declines in cuckoo abundance in Quebec may be correlated to tent caterpillar control programs, and a similar decline was noted in southwestern Colorado after tent caterpillar control efforts there (see web reference above).

Yellow-billed cuckoos may be susceptible to severe weather events during migration. For instance, after the passage of several hurricanes in the area, extensive mortality of yellow-billed cuckoos was noted along the eastern coast of the United States during fall migration (Veit and Petersen 1993). Although drought has not been noted in the literature as a problem for yellow-billed cuckoos, it likely has a significant negative impact on reproductive success, as vegetative understories in western riparian woodlands are typically severely reduced during drought years (D. Wiggins, personal observation). This may affect both foraging success and nest predation rates.

Conservation Status of Yellow-billed Cuckoos in Region 2

Within Region 2, yellow-billed cuckoos appear to have largely disappeared as a breeding species from areas west of the continental divide. They are now exceedingly rare in western Colorado and southwestern Wyoming, and their disappearance from these areas is in step with the rapid decline throughout the western range of the species. Yellow-billed cuckoos are now found only in small numbers, at highly isolated riparian areas in the western United States and northwestern Mexico. The combination of small population size (often < 4 pairs in any locality), extreme isolation, and deteriorating/disappearing breeding habitat has likely hastened the population crashes in the West. Region 2 populations west of the continental divide are likely suffering from a lack of immigration from nearby areas, as the species is now rare in all areas bordering the western portions of Colorado and Wyoming.

While yellow-billed cuckoos are still relatively common on the Great Plains, they are declining in abundance, especially in recent years (**Table 3**). Such declines are most noticeable on the western Great Plains (**Figure 8**), where riparian woodlands are relatively small and are under many of the same pressures (e.g., altered hydrology, heavy livestock grazing) as in the West. However, given that yellow-billed cuckoos are now declining throughout the eastern portions of the range, where habitat structure is very different from that in the West, it appears likely that another factor may be contributing to range-wide declines. Although there are few data available to assess the possibility, reproductive success has been poor in most published studies, suggesting that recruitment of young birds into the breeding population may be driving the declines. Clearly, studies of reproductive success and recruitment within Region 2 would be extremely valuable (see Information Needs section).

Management of Yellow-billed Cuckoos in Region 2

Implications and potential conservation elements

The primary factor affecting the reproductive success of yellow-billed cuckoos in Region 2 is the availability and quality of riparian woodland habitat. Loss and degradation of riparian habitats have been widespread in the West and in North America in general (Noss et al. 1995). The effect of habitat loss/degradation on cuckoos has likely been severe in western and central portions of Region 2, where cuckoo populations are relatively small and where cuckoo habitat is more restricted than in the East. Unfortunately, many of the factors that contribute to riparian habitat degradation, such as livestock grazing, hydrological modification, and clearing of riparian woodlands, are more intensive in arid, western portions of Region 2. Consequently, restoring these areas will require a significant change of philosophy among both private and public landholders.

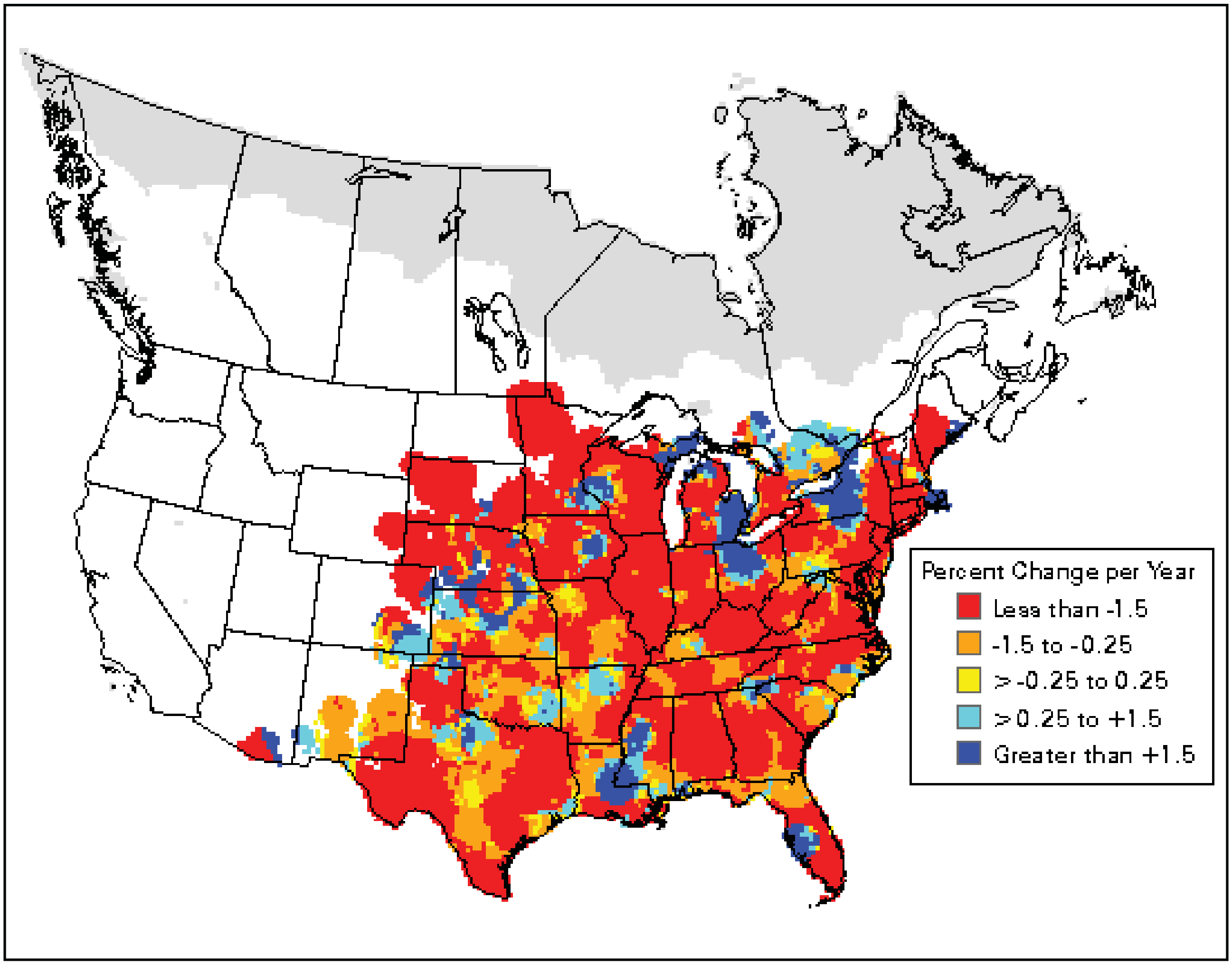

Figure 8. Changes in the mean number of yellow-billed cuckoos counted on breeding bird surveys. Changes are expressed in percentage change per year over the period 1982 to 2003 (data from Sauer et al. 2004).

In western and central portions of Region 2, yellow-billed cuckoos show a strong preference for nesting in large, undisturbed stands of cottonwood/willow gallery forest along waterways. Although we lack a clear historical picture of how such habitat has changed in Region 2, the construction of dams along major rivers and the near-ubiquitous grazing of livestock along riparian woodlands have no doubt led to a decrease in habitat availability and quality (see also Laymon 1998). Although that situation is changing in the Southwest, with the concurrent demise of willow flycatchers (*Epidonax traillii*) and other riparian obligate bird species, there are currently few habitat conservation programs in place for low-elevation riparian woodlands in Region 2.

Cuckoo breeding habitat in Region 2 may be restored by 1) restoring more natural flow regimes to rivers and creeks, 2) restricting or eliminating livestock grazing along riparian areas, and 3) restricting or eliminating the use of pesticides near cuckoo breeding areas. The latter point is especially important in areas where orchards are adjacent to riparian areas, as cuckoos often forage at such sites.

Studies, such as those along the San Pedro River in Arizona (Kreuper et al. 2001), where exclusion of cattle from riparian areas led to a dramatic and rapid recovery of forests and local cuckoo populations suggest that similar management techniques may benefit cuckoos in Region 2. Livestock grazing is a common feature of western riparian areas (Ohmart 1994), with overgrazing common on private lands and seasonal grazing typical of many public lands (e.g., National Wildlife Refuges and National Forest System). Given the significant impact such grazing can have on riparian woodlands, designation of non-grazed sites within public lands, as well as landowner incentives for restoring riparian woodland on private lands would improve riparian habitats in these areas.

Tools and practices

Habitat management

The only published habitat management plan for yellow-billed cuckoos was developed for populations in California (Laymon and Halterman 1989). Although the plan should be modified to reflect the habitat differences between California and Region 2, it could stand as an excellent base for a modified Region 2 habitat management plan for yellow-billed cuckoos. Components of a yellow-billed cuckoo habitat management plan should include the following:

- ❖ restoring riparian woodlands by restoring natural flow regimes to watercourses and by restricting or eliminating livestock grazing
- ❖ evaluating the use of pesticides in riparian woodlands and nearby areas
- ❖ censusing riparian woodlands for before/after effects of any habitat manipulations
- ❖ monitoring reproductive success in managed/unmanaged plots, as well comparing reproductive success before and after habitat manipulations.

Although simply carrying out habitat restoration/modification is likely to have some positive effects, directly measuring cuckoo abundance and reproductive success before and during such work will allow for a more fine-scale assessment of the role of habitat quality in affecting cuckoo population regulation.

Managing riparian woodlands as yellow-billed cuckoo breeding habitat should reveal whether local population declines are being driven primarily by breeding habitat related problems (e.g., woodland degradation, pesticide applications), or whether declines are the result of processes occurring elsewhere (e.g., on the wintering grounds). If habitat manipulations result in a short-term increase in cuckoo abundance and reproductive success, but longer-term population trends remain negative, then it is likely that increasing over-winter mortality during migration and on wintering grounds may be driving the population declines. In that case, an international management plan would be necessary to reverse the trend.

The available evidence suggests that habitat restoration can result in immediate increases in the number of breeding yellow-billed cuckoos. On the Kern River in California, an experiment was undertaken in 1996 to restore willow-cottonwood habitat. The 125 ha (310 acres) of restored habitat immediately attracted breeding cuckoos, and over the entire watershed there was a significant effect of the increase in habitat on the abundance of breeding cuckoos (Laymon et al. 1997, Laymon 1998).

The only other study of the effects of large-scale habitat manipulation on cuckoo populations was carried out in Arizona along the San Pedro River (Kreuper et al. 2001), where the removal of grazing livestock resulted in a dramatic positive effect on vegetation and the number of breeding cuckoos. This study confirmed widespread assumptions that, at least in southwestern riparian areas, livestock grazing is having significant negative impacts on the vegetation understory, and consequent indirect, negative effects on yellow-billed cuckoo abundance.

Inventory and monitoring

As mentioned earlier, problems associated with small sample sizes suggest that the BBS trend results be viewed with some degree of uncertainty in the western United States. In many western states (but not in Colorado or Wyoming), state and federal agencies are now performing annual cuckoo breeding surveys. Monitoring of local cuckoo abundance has been conducted recently in California (Halterman et al. 2003), Arizona (Halterman 2003, Johnson 2003), Nevada (Tomlinson and Halterman 2003), Utah (Johnson and O'Brien 1998), Colorado (Dexter 1998), and New Mexico (Woodward et al. 2003). Relative to standard BBS data, such dedicated surveys are much more likely to provide an accurate picture of the status of western cuckoos, as they utilize methods (e.g., tape playbacks, late summer censusing) that are more attuned to the unusual breeding biology of cuckoos. Such methods should ideally be used to assess the current cuckoo population status in western Colorado and southwestern Wyoming.

A generally accepted survey protocol for yellow-billed cuckoos has not been published, but draft protocols used in several western states are shown in **Appendix A** and **Appendix B**. The generally accepted monitoring protocol is to census riparian woodlands by using tape playbacks of the "kowlp" call. A minimum of three and a maximum of five censuses should be carried out during the breeding season, generally from 15 June to 10 August, with at least 12 days between successive census attempts. **Table 6** outlines specific monitoring techniques. **Appendix A** shows a standardized surveying form that was developed for use in the southwestern United States but that could easily be modified for use in Region 2, primarily by altering the vegetation section to reflect local riparian species. See **Appendix A** and **Appendix B** for further details on census techniques.

Information Needs

Research on the ecology of yellow-billed cuckoos has been most intensive in California and Arizona, where the species is now critically endangered. A similar situation now exists in other western states where cuckoo breeding records are rare, including western Colorado and southwestern Wyoming. Declining populations also characterize the western Great Plains, where cuckoos are largely restricted to heavily impacted riparian areas. The situation in Region 2 suggests that only breeding surveys should be carried out in areas west of the continental divide, as the populations there are now either extremely small or extirpated. Population monitoring and demographic studies should be carried out on the Great Plains, where cuckoo abundance is still sufficient to allow such work.

Cuckoo food habitats and foraging behavior have been studied in habitats outside Region 2, but there is virtually no information on diets or foraging patterns within Region 2 riparian areas. Such information will provide important baseline data and may help to assess how cuckoos may respond to habitat changes. It would be particularly insightful to know the extent to which cuckoos forage in areas that are typically subjected to pesticide applications, such as orchards. In addition, studies of local food habits may help to explain why cuckoos in some populations experience relatively poor hatching and fledging success.

There is very little information available on yellow-billed cuckoo demography. There are no good estimates of adult or juvenile survival, and no data on seasonal, geographical, or age-related differences in reproductive success. Without such data, evaluating the role of demography in cuckoo population regulation is impossible. Demographic data should be collected in areas where cuckoos are relatively common, thus allowing sufficient sample sizes for statistical analysis. In Region 2, suitable areas would be on the Cimarron National Grassland in southwestern Kansas, where riparian areas along the Cimarron River are largely protected from livestock grazing. In addition, although cuckoo abundance is typically lower in the high plains area (relative to the eastern Great Plains), tracking cuckoos should be easier in the high plains as site fidelity is likely higher in western areas with more restricted habitat availability.

Aside from tracking reproductive success, a prime goal of any demographic study should be to band nestlings and adults, preferably with color bands.

Table 6. Survey methods currently in use for yellow-billed cuckoos in the western United States. Techniques were provided by participants in the yellow-billed cuckoo symposium, Cooper Ornithological Society annual meeting, May 2003, Flagstaff, Arizona. Additional methodology was taken from Appendix B of this assessment.

Method	**Explanation**
Survey frequency: 3 to 5 times, between 15 June and 10 August	At least three surveys, spaced at intervals of at least 12 days, with a later survey in August if possible.
Survey stops every 100 to 200 m in appropriate habitat.	Call broadcasts are generally effective up to 100 m.
Recorded should be played back 5 to 10 times at each stop, with 30 to 60 s intervals.	10 playbacks when using 200 m intervals, 5 when using 100m intervals.
Time of day: mid-morning (best) or early evening	Avoid surveys during mid-day heat. 0630 to 1200 is the best period.
Weather conditions: No rain, little wind	Avoid surveys during rain, and when wind is greater than 7 mph.
Call playback: Only the “kowlp” call should be used for surveying	Cuckoos habituate to calls, so other call types should be used only for specific (e.g., nest surveys) purposes.
Avoid checking nest contents: parents will abandon during incubation period	Surveys should be aimed at locating adults - females will often abandon the clutch if disturbed at the nest during incubation.

Although banding nestlings should be relatively straight forward, care will need to be taken not to disturb incubating females as they desert easily. The nesting stage should be monitored closely since nestling cuckoos grow rapidly and leave the nest relatively early. Capturing adults is a time-consuming project that is likely best carried out early in the season before eggs are laid, or just after the young leave the nest and are closely tended by the adults (S. Laymon personal communication 2004). Luring adults into mist nets with taped calls and, if possible, a stuffed or dummy cuckoo is probably the best method of capturing adults for banding. Adults should not be captured at the nest, as the possibility of nest abandonment is too high.

The factors responsible for variance in cuckoo reproductive success are poorly known. The few studies reporting reproductive success (reviewed in Hughes 1999) have shown highly variable results. Formulating management plans for cuckoos would be much easier if we knew how reproductive success was affected by extrinsic factors such as habitat degradation, local food availability, and pesticide use. Although there are difficulties in tracking reproductive success in cuckoos (e.g., disturbance can easily cause nest desertion), such data are critical to understanding whether the range-wide declines are driven primarily by effects on the breeding or on wintering grounds. Thus, studies of cuckoo reproductive success, in different habitat types within Region 2, would allow for a better understanding of the role of reproductive success in regulating cuckoo populations.

Elimination or restriction of livestock grazing, and the consequent effects on vegetation and cuckoo populations, should be tested within several habitat types in Region 2. Such studies would be most easily initiated in federally-managed sites, such as national forests. The Cimarron National Grassland in southwestern Kansas would be a particularly good candidate for such work, as much of the Cimarron River floodplain is under USFS jurisdiction and has not been subjected to livestock grazing. Comparison of cuckoo abundance and reproductive success between the Cimarron National Grassland and nearby grazed riparian areas would allow for an assessment of the role of livestock grazing on cuckoos. In addition, this type of comparison would have the benefit of addressing the effects of grazing on a large number of other bird species that utilize riparian woodlands.

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Appendix A

Instructions for Completing the Yellow-billed Cuckoo Survey and Detection Form

These forms were provided by Murrelet Halterman (cuckoobuster@yahoo.com) and were developed in cooperation with the Arizona Game and Fish Department, the USGS Colorado Plateau Field Station in Flagstaff, Arizona, and with information provided by S.A. Laymon (personal communication).

Explanation of survey form codes:

Page 1: **Site code** is the location of the area you will survey on a given day. Use the standard 2-letter for State, the four-letter code for the **Drainage Code** (ex - Feather River is FEAT, Cosumnes River is COSU) and the **Site code** is the segment of the drainage being surveyed (leave this blank). Visit and Date are both self-explanatory. This information is repeated at the top of each page in case the data sheets become separated.

Site Name is the actual name of the area to be surveyed (ex. Mineral Wash west, or Woodson Bridge). **USGS Quad Name** is the name of the topo sheet from which information was taken. Scale refers to the topo map. **County** and **Management Unit or Owner** can be determined from the topo map. **Ownership** again can be determined from either the topo map or other information provided to the surveyor. **UTM Site Coordinates** are the east and north location of the site. **UTM Source** is the means by which the UTM coordinates were determined. We will mostly be using either generic (these are the hand-held GPS units) or maps. **Site elevation** should be determined from a topo map since the GPS units are very unreliable. **Length of area surveyed** is the total length of habitat (in km) surveyed on a given day. This can be determined using the UTM start and stop points minus the **Distance between Patches**. **Est. area of patches** is the total area surveyed on a given day. This can be determined from the summation of the **Estimated Area of Patches**. **Start time, Stop time**, and **Total hrs** are for the site surveyed, not for the individual patches surveyed.

UTM coordinates for individual patches within this site delineates the beginning and end of individual patches within the survey site for a given day. **#Stops** is the number of survey stops made within the patch. **Patch #** is the number of the patch surveyed within the site being surveyed. A patch is defined as an area of habitat 5 ha or greater in extent that is 300 meters or more from the next closest patch. **Start coordinates** and **Stop coordinates** are again determined either with a hand-held GPS unit or from a topo map. **YBCU?** is a check-off to indicated if cuckoos were detected at that patch. **Photo#** is the numbers on the roll of film of the photos taken of that particular patch.

Distance Between patches is the m between each patch surveyed. **Estimated area of patches** is the area in hectares of each patch. This can be determined form a topo map or estimated (remember - one ha is 100 m X 100 m).

Take at least 2 photographs of habitat in each patch and attach to the data sheets a copy of the USGS quad section with the patch identified. Take at least one photo from outside the patch, and indicate which where the photo was taken (i.e. - #23 on north side of patch looking south). When starting each new roll of film take a picture of a card stating the survey area and the roll number - (i.e. - NCAL roll#2; or LCR roll#1). This way it will be easy to identify each roll of film and match it with the site notes.

Page 2: This sheet is the information to be filled out each time a cuckoo is detected. **Patch number** is the patch the YBCU was located in (there can be multiple detections for a patch). For **Surveyor** is the use the first letter of your first, middle, and last name. **Time** is the time the cuckoo was first detected. **Detection type** is categorized by **casual** (the tape was not played), **playback** (bird was responding to the tape), and **nest** (a nest was located). Within each of these categories is the type of response - was the bird heard only (aural), heard only (visual), or both. **Vocalization Type** – if the cuckoo was vocalizing, which vocalization was it doing? It is possible to have more than one type of vocalization listed. **Breeding Status** is determined from a combination of vocalization and behavior. If a bird is cooing and very interested in the tape, it is unmated. If it gives either a kowlp or a knocker call and shows little interest in the tape, it is probably mated. If it shows some interest in the tape, but never calls, it would probably be unknown. **Age** is determined by bill color, tail color and length, and vocalizations. Adults have yellow on the lower mandible, the tail is approx. as long as the body, and is black with bold white spots. Juveniles have little or no yellow on the lower mandible, the tail is shorter and dark gray with smudgier tail spots. **Note #** refers to any notes made on the reverse of these sheets. Notes should include behavioral observations as well as descriptions of calls and tail markings that can be used to determine sex and breeding status. **Detection UTM –** the UTM coordinates of any cuckoos detected.

Please summarize the day's findings at the bottom of the page. Include the initials of all members of the survey team as well as the date. In the space provided list additional riparian species seen at the site. We are particularly interested in other riparian obligates such as yellow warblers, summer tanagers, Bell's vireos, and yellow-breasted chats.

Page 3: **Vegetation characteristics** is an estimate of the percentage of native (willow, cottonwood, etc.) vs. exotic (Tamarisk, Arundo, etc.) vegetation in the area. The next two categories are a ranking of the major plants present at the site. In an area that dominated by cottonwoods, with lesser quantities of willow and alder, these would be ranked as follows: **1** cottonwoods, **2** willow, **3** alder. If the understory was dominated by wild grape, but also had blackberry and poison oak, it would be ranked as follows: **1** wild grape, **2** blackberry, **3** Other - poison oak. **Average Canopy Height** is for all of the areas surveyed on a given day, as are **Estimated Canopy Cover** and **Average Understory Height** and **Understory Cover**. The final section on the page is for describing differences among the patches surveyed, as well as logging photo numbers.

The final lines of the page are to record names of surveyors as well as who entered the data in the computer and the date this was done.

Page 4: This space is provided for additional comments, notes, etc.

Instructions for completing the Yellow-billed Cuckoo Survey and Detection Form - Repeat Visits

This is essentially the same as the form used for the first visit, bit without the habitat information. Additionally, space is provided for notes on the bottom of the second sheet. If more space is required, then additional sheets should be attached.

Survey form 1. **Yellow-billed Cuckoo Survey and Detection Form** **Page 1**

Site code ☐☐ ☐☐☐☐ ☐☐☐☐ **Visit #** _____ **Date** (mm/dd/yy): __________

| **State** | **Drainage code** | **Site code** | **Surveyor:**_______________________________

Site Name:_________________________ **USGS Quad Name:** _______________ **Scale** (circle):1:24000 1:62500

County: _____________________ **Management Unit or Owner:** _____________________________________

Ownership (circle all that apply): 1-BLM 3-USFS 5-NWR 7-State
2-BOR 4-NPS 6-Tribal 8-Private 9-Other____________

UTM Site Coordinates: Start ☐☐☐☐☐☐ E ☐☐☐☐☐☐☐ N

Stop ☐☐☐☐☐☐ E ☐☐☐☐☐☐☐ N

Collect GPS data in Zone 12 using NAD 83

UTM Source (circle): 1 - PLGR 2 - post processed 3 – generic 4 - Map **Site elevation:** _______ m

Length of area surveyed (sum segments): ___________ km **Est. area of patches** (total area surveyed): _________ha

Start time: __________ **Stop time:** __________ **Total hrs.:** __________

UTM coordinates for individual patches within this site

#Stops	Patch #	Start coordinates		Stop coordinates		YBCU?	Photo#
_____	1	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐	_____
_____	2	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐	_____
_____	3	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐	_____
_____	4	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐	_____
_____	5	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐	_____
_____	6	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐	_____
_____	7	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐	_____
_____	8	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐	_____

Distance Between patches (m)

1→2 ______ **2→3** ______ **3→4** ______ **4→5** ______ **5→6** ______ **6→7** ______ **7→8** ______

Estimated area of patches (ha)

1 ________ **2** ________ **3** ________ **4** ________ **5** ________ **6** ________ **7** ________ **8** ________

Remember to take photographs of habitat in each patch and attach a copy of the USGS quad section.

Site code ☐☐ ☐☐☐☐ ☐☐☐☐ **Visit #** _____ **Date** (mm/dd/yy): __________ **Page 2**

YBCU detect # (**# tape plays**)	Patch #	# times tape played before response	Surveyor use all three initials	Time (24 hr)	Detect. type: 1 - Casual: A = aural V = visual B = both 2 - Playback: A, V, or B		Vocaliz. Type 1 - kowlp 2 - knocker 3 - coo 4 - one note 5 - other 6 - none	Breeding Status: M - mated S -single U –unk. N- Nest: (say why in notes)	Age: A -adult J -juven. U -unk.	Note #	Detection UTM?s (Where first detected) Use GPS if possible. If not, calculate from map.
1											E N
2											E N
3											E N
4											E N
5											E N
6											E N
7											E N
8											E N

Survey summary: # Adults______ **# juveniles**_______ **# territories**_______ **# pairs**______ **# singles**______

Additional Bird Species Detected (use A.O.U. codes)

Site code ☐☐ ☐☐☐☐ ☐☐☐☐ **Visit #** _____ **Date** (mm/dd/yy): __________ **Page 3**

Vegetation Characteristics: Overall, the species in the overstory and understory over the majority of the site are (check box):

☐ **Native**: > 75% ☐ Mixed: 51-75% **native** ☐ Mixed: 51-75% **exotic** ☐ **Exotic**: > 75%

Overstory (rank dominant species for the site): ☐ **Cottonwood** ☐ **Sycamore** ☐ **Willow** ☐ **Mesquite**

☐ **Tamarisk** ☐ **Alder** ☐
Other(s)____

Avg. Canopy Height (est. for site): ________ m **Est. Canopy Cover** (check box): ☐ < 25% ☐ 25-50% ☐

>50%

Understory (rank dominant spp. for the site): ☐ **Cottonwood** ☐ **Willow** ☐ **Mesquite** ☐ **Tamarisk** ☐ **Ash** ☐ **Alder** ☐ **Arrowweed** ☐ **Baccharis** ☐ **Grape** ☐ **Blackberry**
Other(s)____

Avg. Understory Height (est. for site): _____ m **Understory Cover** (est.): ☐ <10% ☐ 10-25% ☐ 26-50% ☐ 51-75% ☐ 76-100%

Is surface water present within 300 m of this site? YES_____ NO _____ Is that true for all patches? YES_____ NO _____

Describe in comments any substantive variation between patches. For example, if the average canopy cover for the site is 30%, but within Patch 3 it is 60%. Similarly, if dominant species or other vegetation parameters show considerable variation it should be noted. Document these differences with photographs whenever possible. Make sure to reference comments to photo #s and note #s whenever available.

Note #	**Comments** (general, or specify note #):	Photo #s

Site code ☐☐ ☐☐☐☐ ☐☐☐☐ **Visit #** _____ **Date** (mm/dd/yy): __________

Use the space below for site access directions, additional comments, notes, drawings of cuckoos, etc.

Survey form 2. **Yellow-billed Cuckoo Survey and Detection Form - REPEAT VISITS**

Site code ☐☐ ☐☐☐☐ ☐☐☐☐ **Visit #** _____ **Date** (mm/dd/yy): __________

| **State** | **Drainage code** | **Site code** | **Surveyor:**________________________________

Site Name:________________________ **USGS Quad Name:** ________________ **Scale** (circle):1:24000 1:62500

County: _________________ **Management Unit or Owner:** ________________ Surveyor _____________________

Ownership (circle all that apply): 1-BLM 3-USFS 5-NWR 7-State
2-BOR 4-NPS 6-Tribal 8-Private 9-Other____________

UTM Site Coordinates: Start ☐☐☐☐☐☐ E ☐☐☐☐☐☐☐ N

Stop ☐☐☐☐☐☐ E ☐☐☐☐☐☐☐ N

Collect GPS data in Zone 12 using NAD 83

UTM Source (circle):1 - PLGR 2 - post processed 3 – generic 4 - Map **Site elevation:** ________ m

Length of area surveyed (sum segments): ___________ km **Est. area of patches** (total area surveyed): ________ ha

Start time: __________ **Stop time:** __________ **Total hrs.:** __________

UTM coordinates for individual patches within this site

#Stops	Patch #	Start coordinates		Stop coordinates		YBCU?	Photo#
_____	1	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐	_____
_____	2	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐	_____
_____	3	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐	_____
_____	4	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐	_____
_____	5	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐	_____
_____	6	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐	_____
_____	7	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐	_____
_____	8	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐	_____

Distance Between patches (m)

1→2 ______ **2→3** ______ **3→4** ______ **4→5** ______ **5→6** ______ **6→7** ______ **7→8** ______

Estimated area of patches (ha)

1 ________ **2** ________ **3** ________ **4** ________ **5** ________ **6** ________ **7** ________ **8** ________

Site code ☐☐ ☐☐☐☐ ☐☐☐☐ **Visit #** _____ **Date** (mm/dd/yy): ________

YBCU detect # (**# tape plays**)	Patch #	Surveyor use all three initials	Time (24 hr	Detect. type: 1 - Casual: A = aural V = visual B = both 2 - Playback: A, V, or B		Vocaliz. Type 1 - kowlp 2 - knocker 3 - coo 4 - one note 5 - other 6 - none	Breeding Status: M -mated S -single U –unk. N- Nest: (say why in notes)	Age: A -adult J -juven. U - unk.	Note #	Detection UTM?s (Where first detected) Use GPS if possible. If not, calculate from map.
1	–									E N
2										E N
3										E N
4										E N
5										E N
6										E N
7										E N
8										E N

Survey summary: # Adults_____ **# juveniles**___ **# pairs**_______ **# singles**_______

Comments and notes:

____

____

____

Additional Bird Species Detected (use A.O.U. codes

Appendix B

Draft Yellow-billed Cuckoo Survey and Monitoring Protocol for California

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Revised: 13 July 1998

Introduction: In the western United States a petition has recently (February 1998) been filed to list the western subspecies of the Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*) as a Federally Endangered Species. The species is extremely rare in California, with less than 50 pairs recorded during the last statewide survey in 1986-1987. There is no indication that the population has increased since that survey. The population in California is concentrated along the Sacramento River from Red Bluff to Colusa and along the South Fork Kern River near Weldon. Other breeding locations of small numbers of pairs are along the Feather River from Oroville to Verona, along the Owens River, along the Amargosa River, and in the Prado Flood Control Basin. The western subspecies, officially known as the California Yellow-billed Cuckoo, is also sometimes referred to as the Western Yellow-billed Cuckoo. The cuckoo has a large home range, calls infrequently when mated, and is rarely detected visually. It is also territorial only in a limited sense. These factors render traditional bird survey methods, such as point counts and transects, of limited value to determine the presence/absence or abundance of the species. Playback surveys are the recommended method for conducting surveys. Because of large and overlapping home ranges, locating all nests in a population is the only way to census (i.e. to do a complete count of) the population.

Survey method: Playback of the cuckoo's pair contact call ("kowlp" call) has proved to be the best method to survey the species. The tape-recorded call should be able to be easily heard for a minimum of 100 m. I recommend a dual speaker, sports tape recorder, like the Sanyo "Outsider" or Sony "Outback". These recorders have both the power to project the required distance, lack of distortion at high volume, and are rugged enough to stand up under field conditions. I have been using a Sanyo "Outsider" for the past 10 years with no trouble, but have been unable to obtain a replacement. If you find a source please spread the word.

Any recording of the "kowlp" call is fine. I always use the recording from the Peterson Field Guide tape because it is distinctive and I can tell the difference between a real cuckoo and another cuckoo surveyor's tape. Never use a tape of the cooing call, which is given only by unmated males, to survey for cuckoos. This call will reduce the response rate of mated cuckoos below what it would be if no call were used.

Surveys should be conducted between the hours of 6:30 and noon. The hot part of the day should be avoided as response rate declines sharply. I would avoid conducting surveys when the temperature exceeds 100 degrees. Surveys in the late afternoon (6:00) and evening (8:00) are also possible but the survey results have not been compared to known populations. Survey stops located every 200 m along the forest edge are recommended. If the forest patch is greater than 100 m in width, it will be necessary to make two or more transects through the patch. In some locations, surveys can be conducted from a dry creek bed with up to 100 m of habitat on either side. No part of the patch should be more than 100 m from a survey location. In terms of the number of survey stations/40 ha (100 acres), 12 stops would be needed for a square habitat patch (633 m x 633 m), 10 stops for a 200 m x 2000 m patch, and 20 stops for a 100 m x 4000 m patch.

The recorded call should be played about 10 times at each stop, with about 30-60 second pauses between each call. An alternative is to stop every 100 m and play the tape 5 times at each stop. I have not found one method to be superior to another. The pauses between the calls are extremely important. Cuckoos rarely respond instantly and usually wait 30 seconds or more before responding. If you are walking, talking, or playing the tape you will probably not hear the response. Approximately 4 km of habitat can by surveyed per morning.

Three surveys of your study area should be conducted during the breeding season. In California, surveys should not be conducted before 15 June, because most cuckoos have not arrived before that date. Surveys should not be conducted after 10 August because many cuckoos have become very quiet and rarely respond. Surveys should be conducted 10 to 14 days apart between the 15 June to 10 August period. This spacing allows the surveyor to hit the various stages of the nesting cycle for any given pair, increasing the chance of response.

Surveys should not be carried out in winds over 7 mph because this reduces both the cuckoo's response rate and your ability to hear the response. Likewise, surveys should not be conducted when it is raining. Rain is generally not a problem in California during the survey period.

Survey results: With surveys for sensitive species, the problem of presence vs. absence vs. not found always arises. A response by a cuckoo during a survey of course indicates that a cuckoo is present at the site. Surveys conducted at sites where the population is known indicate that with three surveys there is approximately a 95% chance of detecting at least one member of a pair. Therefore, there is approximately a 5% chance of cuckoos being present at the site but not being detected during the survey.

The absence (or presumed absence) of cuckoos in any given year does not indicate that the site is never used by cuckoos. Some sites in California have been unoccupied by breeding pairs for five or six years only to be reoccupied. In addition, numbers of pairs can vary greatly from year to year at even the best sites. At the South Fork Kern River, from 1985 to 1997, the cuckoo population has varied from a low of three pairs to a high of 23 pairs. We recommend that surveys be conducted for a minimum of three years to capture the variation in population size and to conclude that cuckoos are actually absent.

Cuckoo response and call context: Cuckoos can respond to the taped calls in several ways. How they respond depends on their breeding status, breeding season phenology, and individual variation.

Unmated male cuckoos will often fly into where the observer is located and, after one or two minutes, will respond with a cooing call. The cooing call is a mate attraction call and is therefore the song of the cuckoo. To the inexperienced, the call could easily be mistaken for a Mourning Dove. Experienced observers sometimes mistake this call for the call of a Greater Roadrunner. The main difference is that the Roadrunner call descends while each note of the Yellow-billed Cuckoo call is on the same pitch. This cooing can continue indefinitely and unmated male cuckoos will sometimes follow a surveyor for several hours. It is sometimes necessary to skip a survey location to lose these unmated males.

Unmated female cuckoos, when they respond at all, often fly in and silently observe the surveyor. On a few occasions I have had them respond with a low guttural call similar to, but much lower and hoarser than cooing.

Mated male and female cuckoos sometimes also respond by flying in silently, but usually they respond from a ways off with a contact “kowlp” call. Mated cuckoos never coo. Both male and female cuckoos make a “kowlp” call and the sexes can only be told apart by call with much experience. In the vicinity of an active nest both male and female will make a soft knocking call which is used to tell the mate and young that a predator is near. This call can be made in response to your presence or to the presence of a hawk or owl.

Juvenile cuckoos that are still dependent on the adults for food will respond with a soft clucking call, which tells the parents their location. As the young get older (3-4 weeks out of the nest), the clucking gets louder and begins to resemble the parents “kowlp” call.

Nest location and monitoring: Nest location is the only method to determine an exact count (census) of Yellow-billed Cuckoo populations. I recommend that nest location only be done after training by someone experienced with the species. Nest finding by an untrained person, unfamiliar with the subtleties of cuckoo behavior and calls, could result in nest loss or abandonment. Locating nests of Yellow-billed Cuckoos is very difficult and time consuming. An average of 4 person days, by experienced cuckoo nest finders, is needed to locate a nest. Cuckoos view humans as predators and are therefore very wary around the nest and literally will not go to a nest if they know you are watching them. This accompanied with the large home range (up to 100 acres) and the dense vegetation in which they nest make nest finding extremely difficult. Nest finding is easier during the nest building stage, but is not recommended because of the possibility of abandonment. The optimum time to locate nests, both from the standpoint of ease of nest finding and the least likelihood of nest abandonment, is while they are feeding the young. Once nests are found, they should be checked only when the parents are absent.

Surveyor qualifications: It is recommended that those who are planning to survey for this species should attend a training course before conducting surveys. This is needed because of the cuckoo’s cryptic nature, the difficulty of identification of some of its calls, and the need to understand the call.

Verified sightings should be considered sightings that have been made by field biologists who have experience with the species. The best way to get experience is to take a cuckoo workshop or accompany trained observers on a survey. Many highly skilled birdwatchers and field ornithologists also have the necessary knowledge to positively identify this species. In the case of untrained and inexperienced observers, a tape recording or photo would be necessary for the sighting to be considered verified.

Futher reading:

Franzreb, K.E. and S.A. Laymon. 1993. A Reassessment of the Status of the Yellow-billed Cuckoo. Western Birds 24:17-28.

Gaines, D. and S.A. Laymon. 1984. Decline, status and preservation of the Yellow-billed Cuckoo in California. Western Birds 15:49-80.

Halterman, M.D. 1991. Distribution and habitat use of the Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*) on the Sacramento River, California, 1987-1990. Masters Thesis, California State University, Chico, CA.

Launer, A.E., D.D. Murphy, S.A. Laymon, and M.D. Halterman. 1990. 1990 distribution and habitat requirements of the Yellow-billed Cuckoo in California. Admin. Rept. to the Nature Conservancy.

Laymon, S.A. 1980. Feeding and nesting behavior of the Yellow-billed Cuckoo in the Sacramento Valley. Admin. Rep. 80-2. Wildlife Management Branch, Dept. of Fish and Game, Sacramento, California. 28 pp.

Laymon, S.A. 1998. Partners in Flight bird conservation plan: Yellow-billed Cuckoo (*Coccyzus americanus*). Admin. Rept. to California Partners in Flight.

Laymon, S.A. and M.D. Halterman. 1987. Yellow-billed Cuckoos: can the western subspecies be saved from extinction? Western Birds 18:19-25.

Laymon, S.A. and M.D. Halterman. 1989. A proposed habitat management plan for Yellow-billed Cuckoos in California. Pages 272-277 *in* D. Able, editor. California Riparian Systems: protection, management and restoration for the 1990's. USDA Forest Service, General Technical Report PSW-110, Berkeley, CA.

Laymon, S.A., P.L. Williams, and M.D. Halterman. 1997. Breeding status of the Yellow-billed Cuckoo in the South Fork Kern River Valley, Kern County, California: Summary Report 1985 – 1996. Admin. Rept. USDA Forest Service, Sequoia National Forest, Cannell Meadow Ranger District, Challenge Cost-share Grant #92-5-13.

Appendix E: Species List

Appendix E – Species List – Caliente Youth Center flood Mitigation Project 2013

American Dusky Flycatcher, *Empidonax oberholseri* I
American Robin, *Turdus migratorius* I
Barn Swal ow, *Hirundo rustica* I
Black-headed Grosbeak, I *heucticus s melanocephalus* I
Brewer's Blackbird, *Euphagus cyanocephalus* I
Canyon Wren, *Catherpes mexicanus* I
Common Nighthawk, *Chordeiles minor* I
Common Poorwil , I *halaenoptilus nuttallii* I
Common Raven, *Corvus corax* I
Common Yel owthroat, *Geothlypis trichas* I
Cooper's Hawk, *Accipiter cooperii* I
European Starling, *Sturnus vulgaris* (I) I
Great Horned Owl, *Bubo virginianus* I
Great-tailed Grackle, *Quiscalus mexicanus* I
airy Woodpecker, I *icoides villosus* I
ouse Finch, I *Haemorhous mexicanus* I
Juniper Titmouse, *Baeolophus ridgwayi* I
Mal ard, *Anas platyrhynchos* I
Mourning Dove, *Zenaida macroura* I
Northern Flicker, *Colaptes auratus* I
Northern Mockingbird, *Mimus polyglottos* I
Red-tailed Hawk, *Buteo jamaicensis* I
Red-winged Blackbird, *Agelaius phoeniceus* I
Rufous Hummingbird, *Selasphorus rufus* I
Savannah Sparrow, *Pas erculus sandwichensis* I
Song Sparrow, *Melospiza melodia* I
Spotted Towhee, I *ipilo maculatus* I
Summer Tanager, I *iranga rubra* I
Tree Swal ow, *Tachycineta bicolor* I
Turkey Vulture, *Cathartes aura* I
Warbling Vireo, *Vireo gilvus* I
Western Tanager, I *iranga ludoviciana* I
Wilson's Warbler, *Cardellina pusilla* I
Yel ow Warbler, *Setophaga petechia* I
Yel ow-rumped Warbler, *Setophaga coronata* I
Mule Deer, I *docolious hemionus hemonious* I
Striped skunk, *Mephitis mephitis* I
Tamias sp. s

Appendix F: Survey forms

Appendix 1. Willow Flycatcher Survey and Detection Form

Always check the U.S. Fish and Wildlife Service Arizona Ecological Services Field Office web site (http://www.fws.gov/southwest/es/arizona/) for the most up-to-date version.

Willow Flycatcher (WIFL) Survey and Detection Form (revised April 2010)

Site Name CALIENTE YOUTH CENTER State NV County LINCOLN
USGS Quad Name CALIENTE Elevation 1,341 m (4,400') (meters)
Creek, River, Wetland, or Lake Name MEADOW VALLEY WASH / CLOVER CREEK WASH
Is copy of USGS map marked with survey area and WIFL sightings attached (as required)? Yes X No___

Survey Coordinates: Start: E 720100 N 4166445 UTM Datum NAD 83 (See instructions)
Stop: E 719571 N 4166335 UTM Zone 11
If survey coordinates changed between visits, enter coordinates for each survey in comments section on back of this page.
***** Fill in additional site information on back of this page *****

Survey # Observer(s) (Full Name)	Date (m/d/y) Survey time	Number of Adult WIFLs	Estimated Number of Pairs	Estimated Number of Territories	Nest(s) Found? Y or N If Yes, number of nests	Comments (e.g., bird behavior; evidence of pairs or breeding; potential threats [livestock, cowbirds, *Diorhabda* spp.]). If *Diorhabda* found, contact USFWS and State WIFL coordinator	GPS Coordinates for WIFL Detections (this is an optional column for documenting individuals, pairs, or groups of birds found on each survey). Include additional sheets if necessary. # Birds	Sex	UTM E	UTM N
Survey # 1 Observer(s)	Date 31 MAY 13 Start 0415 Stop 0930 Total hrs 5.25	Ø	N/A	Ø	N					
Survey # 2 Observer(s)	Date 25 JUN 13 Start 0421 Stop 0930 Total hrs 5.2	Ø	N/A	Ø	N					
Survey # 3 Observer(s)	Date 30 JUN 13 Start 0430 Stop 0930 Total hrs 5	Ø	N/A	Ø	N					
Survey # 4 Observer(s)	Date 14 JUL 13 Start 0430 Stop 0930 Total hrs 5	Ø	N/A	Ø	N					
Survey # 5 Observer(s)	Date Start Stop Total hrs ___									
Overall Site Summary Totals do not equal the sum of each column. Include only resident adults. Do not include migrants, nestlings, and fledglings. Be careful not to double count individuals. Total Survey Hrs___		Total Adult Residents: Ø	Total Pairs: Ø	Total Territories: Ø	Total Nests: Ø	Were any Willow Flycatchers color-banded? Yes___ No X If yes, report color combination(s) in the comments section on back of form and report to USFWS.				

Reporting Individual GARTH ALLING Date Report Completed 8 AUG 13
US Fish and Wildlife Service Permit #___ State Wildlife Agency Permit #___

***Submit** form to USFWS and State Wildlife Agency by September 1st. Retain a copy for your records.*

Fill in the following information completely. Submit form by September 1st. Retain a copy for your records.

Reporting Individual GARTH ALLING Phone # (775) 586-4700
Affiliation CITY OF CALIENTE (CONTRACTOR) E-mail GALLING@HAUGEBRUECKASSOC.COM
Site Name CALIENTE YOUTH CENTER Date Report Completed 8 AUG 13

Did you verify that this site name is consistent with that used in previous years? Yes ____ No ____ Not Applicable X
If site name is different, what name(s) was used in the past?____
If site was surveyed last year, did you survey the same general area this year? Yes ____ No ____ If no, summarize below.
Did you survey the same general area during each visit to this site this year? Yes ____ No ____ If no, summarize below.

Management Authority for Survey Area : Federal____ Municipal/County X State ____ Tribal ____ Private ____
Name of Management Entity or Owner (e.g., Tonto National Forest) CITY OF CALIENTE, NV

Length of area surveyed: 610 m (meters)

Vegetation Characteristics: Mark the category that best describes the predominant tree/shrub foliar layer at this site (check one):

X Native broadleaf plants (entirely or almost entirely, > 90% native, includes high-elevation willow)

____ Mixed native and exotic plants (mostly native, 50 - 90% native)

____ Mixed native and exotic plants (mostly exotic, 50 - 90% exotic)

____ Exotic/introduced plants (entirely or almost entirely, > 90% exotic)

Identify the 2-3 predominant tree/shrub species in order of dominance. Use scientific name.
POPULOUS FREEMONTII, SALIX LAEVIGATA, SALIX EXIGUA

Average height of canopy (Do not include a range): 6 m (meters)

Attach copy of USGS quad/topographical map (REQUIRED) of survey area, outlining survey site and location of WIFL detections.
Attach sketch or aerial photo showing site location, patch shape, survey route, location of any WIFLs or WIFL nests detected.
Attach photos of the interior of the patch, exterior of the patch, and overall site; describe any unique habitat features.

Comments (attach additional sheets if necessary)
PASSIVE SURVEY PERFORMED, NO CALLS BROADCAST

Territory Summary Table. Provide the following information for each verified territory at your site.

Territory Number	All Dates Detected	UTM N	UTM E	Pair Confirmed? Y or N	Nest Found? Y or N	Description of How You Confirmed Territory and Breeding Status (e.g., vocalization type, pair interactions, nesting attempts, behavior)

Attach additional sheets if necessary

Survey form 1. **Yellow-billed Cuckoo Survey and Detection Form** **Page 1**

Site code N V | C L O V | _ _ _ _
| State | Drainage code | Site code |

Visit # 1 **Date** (mm/dd/yy): 06/25/13
Surveyor: G. ALLING

Site Name: CALIENTE YOUTH CENTER **USGS Quad Name:** CALIENTE **Scale** (circle): 1:24000 1:62500

County: LINCOLN **Management Unit or Owner:** CALIENTE, CITY OF

Ownership (circle all that apply): 1-BLM 2-BOR 3-USFS 4-NPS 5-NWR 6-Tribal 7-State 8-Private 9-Other CALIENTE

UTM Site Coordinates: Start 720100 E 4166448 N

Stop 719571 E 4166335 N

Collect GPS data in Zone 12 using NAD 83

UTM Source (circle): 1 - PLGR 2 - post processed 3 – generic 4 - Map **Site elevation:** 1341 m

Length of area surveyed (sum segments): 0.60 km **Est. area of patches** (total area surveyed): 12 ha

Start time: 0800 **Stop time:** 1030 **Total hrs.:** 2.5

UTM coordinates for individual patches within this site

#Stops	Patch #	Start coordinates		Stop coordinates		YBCU?	Photo#
		E	N	E	N		
	1					☐	
	2					☐	
	3					☐	
	4					☐	
	5					☐	
	6					☐	
	7					☐	
	8					☐	

Distance Between patches (m)

1→2 ______ 2→3 ______ 3→4 ______ 4→5 ______ 5→6 ______ 6→7 ______ 7→8 ______

Estimated area of patches (ha)

1 ______ 2 ______ 3 ______ 4 ______ 5 ______ 6 ______ 7 ______ 8 ______

Remember to take photographs of habitat in each patch and attach a copy of the USGS quad section.

Site code N V C L O V **Visit #** 1 **Date** (mm/dd/yy): 06/25/13 **Page 2**

YBCU detect # (# tape plays)	Patch #	# times tape played before response	Surveyor use all three initials	Time (24 hr)	Detect. type: 1 - Casual: A = aural V = visual B = both 2 - Playback: A, V, or B	Vocaliz. Type 1 - kowlp 2 - knocker 3 - coo 4 - one note 5 - other 6 - none	Breeding Status: M - mated S -single U –unk. N- Nest: (say why in notes)	Age: A -adult J -juven. U -unk.	Note #	Detection UTM?s (Where first detected) Use GPS if possible. If not, calculate from map.
1	NO DETECTIONS									E N
2										E N
3										E N
4										E N
5										E N
6										E N
7										E N
8										E N

Survey summary: # Adults______ # juveniles______ # territories______ # pairs______ # singles______

Additional Bird Species Detected (use A.O.U. codes)

SEE REPORT

Site code N V C L O V ☐☐☐☐ **Visit #** 1 **Date** (mm/dd/yy): 06/22/13 **Page 3**

Vegetation Characteristics: Overall, the species in the overstory and understory over the majority of the site are (check box):

☑ **Native:** > 75% ☐ Mixed: 51-75% **native** ☐ Mixed: 51-75% **exotic** ☐ **Exotic:** > 75%

Overstory (rank dominant species for the site): 1 **Cottonwood** ☐ **Sycamore** 2 **Willow** ☐ **Mesquite**

☐ **Tamarisk** ☐ **Alder** ☐
Other(s)____

Avg. Canopy Height (est. for site): 6 m **Est. Canopy Cover** (check box): ☐ < 25% ☑ 25-50% ☐

>50%

Understory (rank dominant spp. for the site): ☐ **Cottonwood** 1 **Willow** ☐ **Mesquite** ☐ **Tamarisk** ☐
Ash ☐ **Alder** ☐ **Arrowweed** ☐ **Baccharis** ☐ **Grape** ☐ **Blackberry**
Other(s)__________________________________

Avg. Understory Height (est. for site): 2 m **Understory Cover** (est.): ☐ <10% ☑ 10-25% ☐ 26-50% ☐ 51-75% ☐ 76-100%

Is surface water present within 300 m of this site? YES ✓ **NO** ____ **Is that true for all patches? YES** ✓ **NO** ____

Describe in comments any substantive variation between patches. For example, if the average canopy cover for the site is 30%, but within Patch 3 i is 60%. Similarly, if dominant species or other vegetation parameters show considerable variation it should be noted. Document these differences with photographs whenever possible. Make sure to reference comments to photo #s and note #s whenever available.

Note #	**Comments** (general, or specify note #):	Photo #s
	NO YELLOW-BILLED CUCKOO DETECTIONS	
	SEE REPORT FOR PHOTOGRAPHS.	

Site code ☐☐ ☐☐☐☐ ☐☐☐☐ **Visit #** _____ **Date** (mm/dd/yy): __________

Use the space below for site access directions, additional comments, notes, drawings of cuckoos, etc.

Survey form 2. **Yellow-billed Cuckoo Survey and Detection Form - REPEAT VISITS**

Site code NV CLOV ☐☐☐☐ **Visit #** 2 **Date** (mm/dd/yy): 06/30/13

| **State** | **Drainage code** | **Site code** | **Surveyor:** G. ALLING

Site Name: CALIENTE YOUTH CENTER **USGS Quad Name:** CALIENTE **Scale** (circle): 1:24000 1:62500

County: LINCOLN **Management Unit or Owner:** CALIENTE, CITY Surveyor G. ALLING

Ownership (circle all that apply): 1-BLM 2-BOR 3-USFS 4-NPS 5-NWR 6-Tribal 7-State 8-Private 9-Other CALIENTE

UTM Site Coordinates: Start 720100 E 4166448 N

Stop 719571 E 4166335 N

Collect GPS data in Zone 12 using NAD 83

UTM Source (circle): 1 - PLGR 2 - post processed 3 – generic 4 - Map **Site elevation:** 1341 m

Length of area surveyed (sum segments): 0.60 km **Est. area of patches** (total area surveyed): 12 h

Start time: 0754 **Stop time:** 1042 **Total hrs.:** 2.25

UTM coordinates for individual patches within this site

#Stops	Patch #	Start coordinates		Stop coordinates		YBCU?	Photo#
____	1	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐	____
____	2	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐	____
____	3	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐	____
____	4	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐	____
____	5	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐	____
____	6	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐	____
____	7	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐	____
____	8	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐☐☐☐☐☐ E	☐☐☐☐☐☐☐ N	☐	____

Distance Between patches (m)

1→2 ______ 2→3 ______ 3→4 ______ 4→5 ______ 5→6 ______ 6→7 ______ 7→8 ______

Estimated area of patches (ha)

1 ________ 2 ________ 3 ________ 4 ________ 5 ________ 6 ________ 7 ________ 8 ________

Site code NV CLOV ____ **Visit #** 2 **Date** (mm/dd/yy): 06/30/13

YBCU detect # (# tape plays)	Patch #	Surveyor use all three initials	Time (24 hr)	Detect. type: 1 - Casual: A = aural V = visual B = both 2 - Playback: A, V, or B		Vocaliz. Type 1 - kowlp 2 - knocker 3 - coo 4 - one note 5 - other 6 - none	Breeding Status: M -mated S -single U -unk. N- Nest: (say why in notes)	Age: A -adult J -juven. U - unk.	Note #	Detection UTM?s (Where first detected) Use GPS if possible. If not, calculate from map.
1	– NO DETECTIONS									E N
2										E N
3										E N
4										E N
5										E N
6										E N
7										E N
8										E N

Survey summary: # Adults_____ **# juveniles**___ **# pairs**______ **# singles**______

Comments and notes: NO DETECTIONS

Additional Bird Species Detected (use A.O.U. codes)

Survey form 2. **Yellow-billed Cuckoo Survey and Detection Form - REPEAT VISITS**

Site code N V C C O V □□□□ **Visit #** 3 **Date** (mm/dd/yy): 04/14/13
| **State** | **Drainage code** | **Site code** | **Surveyor:** G. ALLING

Site Name: CALIENTE YOUTH CENTER **USGS Quad Name:** CALIENTE **Scale** (circle): 1:24000 1:62500
County: LINCOLN **Management Unit or Owner:** CALIENTE CITY Surveyor G. ALLING

Ownership (circle all that apply): 1-BLM 2-BOR 3-USFS 4-NPS 5-NWR 6-Tribal 7-State 8-Private 9-Other CALIENTE

UTM Site Coordinates: Start 720100 E 4166448 N

Stop 719571 E 4166335 N

Collect GPS data in Zone 12 using NAD 83

UTM Source (circle): 1 - PLGR 2 - post processed 3 – generic 4 - Map **Site elevation:** 341 m

Length of area surveyed (sum segments): 0.60 km **Est. area of patches** (total area surveyed): 12 h

Start time: 0750 **Stop time:** 1052 **Total hrs.:** 3

UTM coordinates for individual patches within this site

#Stops	Patch #	Start coordinates		Stop coordinates		YBCU?	Photo#
	1	E	N	E	N	□	
	2	E	N	E	N	□	
	3	E	N	E	N	□	
	4	E	N	E	N	□	
	5	E	N	E	N	□	
	6	E	N	E	N	□	
	7	E	N	E	N	□	
	8	E	N	E	N	□	

Distance Between patches (m)

1→2 ____ **2→3** ____ **3→4** ____ **4→5** ____ **5→6** ____ **6→7** ____ **7→8** ____

Estimated area of patches (ha)

1 ____ **2** ____ **3** ____ **4** ____ **5** ____ **6** ____ **7** ____ **8** ____

Site code N V C L O V   **Visit #** 3 **Date** (mm/dd/yy): 07/14/13

YBCU detect # (# tape plays)	Patch #	Surveyor use all three initials	Time (24 hr)	Detect. type: 1 - Casual: A = aural V = visual B = both 2 - Playback: A, V, or B		Vocaliz. Type 1 - kowlp 2 - knocker 3 - coo 4 - one note 5 - other 6 - none	Breeding Status: M -mated S -single U -unk. N- Nest: (say why in notes)	Age: A -adult J -juven. U -unk.	Note #	Detection UTM?s (Where first detected) Use GPS if possible. If not, calculate from map.
1	- NO DETECTIONS									E N
2										E N
3										E N
4										E N
5										E N
6										E N
7										E N
8										E N

Survey summary: # Adults____ # juveniles___ # pairs______ # singles______

Comments and notes:

NO DETECTIONS

Additional Bird Species Detected (use A.O.U. codes)

Appendix G – 8-Step Analysis for EO 11988

Floodplain Management and Protection of Wetlands
Summary of 8-Step Decision-Making Process
State of Nevada Public Works Division Caliente Youth Center Bridge Project
PDM-PJ-09-NV-2012-002

The Department of Homeland Security's Federal Emergency Management Agency (FEMA) proposes to provide Federal financial assistance, through the Nevada Division of Emergency Management (NDEM), to the State of Nevada's Public Works Division (subapplicant) for construction of a new 90' clear-span bridge over Clover Creek in Caliente, Nevada.

Through the NDEM, the subapplicant applied to the FEMA Region IX Pre-Disaster Mitigation (PDM) Program for funding to implement a flood mitigation project in the City of Caliente in Lincoln County, Nevada. The PDM Program was authorized by Section 203 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, Title 42 of United States Code Part 5133 as amended by Section 102 of the Disaster Mitigation Act of 2000 (Public Law 106-390, 114 Statutes 1552) to assist states and communities with implementation of sustained, pre-disaster, natural-hazard mitigation programs with the objective of reduction to overall risk to the population and structures, while reducing reliance on funding from actual disaster declarations.

Therefore, the purpose of the proposed project is to provide PDM Program funding to the subapplicant to design, acquire environmental clearance, and permit a safe and permanent solution to the access, flooding, and unstable stream bank conditions in and around the Caliente Youth Center access road crossing of Clover Creek in Caliente, NV.

Past flood events and potential climate change impacts create a need to develop and implement design solutions. The design solutions need to incorporate the following goals:

- Eliminate flooding access issues for the Caliente Youth Center.
- Increase public health and safety for the residents and staff of Caliente Youth Center and the community as a whole.
- Improve stream hydraulics by improving stream dynamics.
- Reduce flood hazards to the community's critical infrastructure (water and sewer).
- Protect the community's electrical substation.
- Reduce the financial cost of after-the-fact flood clean-up.

The project involves removal of the existing twelve-foot diameter pipe culverts and concrete headwall. The conveyance of the existing culverts is insufficient to adequately pass flows, sediment, and debris from moderate flood events. The existing culverts are substantially undersized for severe flood events. (Figure 2) The proposed project would replace the existing culverts with a spanning structure (bridge) with sufficient capacity to allow passage of the 100-year flood event and associated sediment and debris without overtopping the access road.

The proposed project entails the construction of the following improvements on Clover Creek, just upstream from the confluence of Clover Creek and the Meadow Valley Wash within the City of Caliente, NV:

1) A new clear-span 90 feet long by 40 feet wide bridge replacing the existing undersized culverts under Youth Center Drive. The bridge would span the entire width of the channel and would not require piers to be constructed in the channel. All bridge members (e.g. girders, expansion joints, etc.) would be placed above the high water mark, providing one lane of travel in each direction. Construction would include the bridge approaches, abutments and wingwalls. The clear opening from the bed elevation to the underside of the bridge would be approximately 13 feet.

2) Streambed and bank restoration/stabilization both upstream and downstream adjacent to the new bridge crossing.

3) A grade control structure would be constructed upstream from the crossing to provide a base level control point for the channel. The proposed rip-rap grade control structure would be constructed in Clover Creek approximately 200 feet upstream from the existing Youth Center Drive culverts. The purpose of the grade-control structure is to protect the channel from an upstream headcut and reduce the likelihood of mobilization and transport of stored sediments in the channel. The grade control structure would be approximately 20 feet deep filled with rip-rap or large dense rocks. At channel grade, the grade control structure would be approximately 90 feet long by 65 feet wide. Below grade the structure would narrow to 50 feet long by 25 feet wide.

4) Relocation of sewer and water infrastructure to accommodate the new bridge.

5) Appropriate temporary (during construction) and permanent Best Management Practice (BMP's) and mitigation measures would be employed as an important project element to insure the protection of soil, water, air, biological and historic properties and archaeological resources.

6) Approximately 2,500 square feet of existing pavement would be removed, and approximately 3,050 cubic yards of earthwork would be excavated and graded at the location of the existing culverts and adjacent banks. An additional 2,630 cubic yards of excavation would be required for the grade control structure.

7) To facilitate continued access and construction of the improvements, a temporary low-water crossing is necessary to provide access to existing uses upstream of the project site. A culvert would be used to convey normal channel flows beneath the temporary road during construction. On completion of the proposed project, the temporary road and culvert would be removed and disturbed areas revegetated prior to project completion. Staging areas would be located within paved and other previously disturbed areas near the project area.

8) Construction would occur during the seasonally dry months, August through November, which would also avoid the breeding season of migratory birds that may nest in or adjacent to the project site. The proposed project would be completed within 120 days.

The results of the Eight-Step Decision-Making Process are summarized below.

Step 1. *Determine whether the proposed action is located in a wetland and /or the 100 year floodplain (500-year floodplain for critical actions); and whether it has the potential to affect or be affected by a floodplain or wetland.*

Based on the FEMA Map Service Center's 2010 Lincoln County Flood Zone maps, the majority of the City of Caliente lies within a 100-year flood zone. The project area lies within floodway area Zone AE. The United States Fish and Wildlife Service National Wetlands Inventory does not include Clover Creek and its immediate surrounding within its inventory maps. However, Nevada Division of Environmental Protection (NDEP) Statewide Wetland Inventory Priority Project (2007) identified Meadow Valley Wash lower including Clover Creek as a high priority wetland, though there was no mapping associated with the NDEP project. The NEPA Environmental Assessment (EA) analysis prepared by FEMA for the proposed project has identified the project area as potential wetlands for the purpose of the EA.

Sited in the purpose and need of the proposed project's EA is the identification of the current flood risk conditions, past flood events and impacts created, and identified project goals that include:

- Eliminate flooding access issues for the Caliente Youth Center.
- Increase public health and safety for the residents and staff of Caliente Youth Center and the community as a whole.
- Improve stream hydraulics by improving stream dynamics.
- Reduce flood hazards to the community's critical infrastructure (water and sewer).
- Protect the community's electrical substation.
- Reduce the financial cost of after-the-fact flood clean-up.

By its very nature the proposed project is required to be within the existing floodway and the potential wetland. The proposed project proposes to construct a clear-span bridge with no structural member located within the streambed and provide a clearance of 13 feet, which is above the potential elevation of a 100-year event. Purposefully, the project is designed to eliminate any obstruction to stream-carried woody debris or stream-carried sediments. The design influences the hydraulics and hydrology to maintain the natural stream channel, reduces bank erosion, restoration of past flood impacts and facilitates reestablishment of vegetation within the project area. The proposed project is not likely to affect or be affected by the floodplain or wetland.

Step 2. *Notify the public at the earliest possible time of the intent to carry out an action in a floodplain or wetland, and involve the affected and interested public in the decision-making process.*

FEMA published a Scoping Notice and Notice of Intent that included information about the FEMA's intent to carry out actions in or affecting the floodplain and potential wetland areas of Clover Creek drainage within the City of Caliente, Nevada. FEMA received comments from United States Fish and Wildlife Service (USFW), United States Army Corps of Engineers (USACOE), Nevada Division of Wildlife (NDOW), Confederated Tribes of the Goshute Reservation (CTGR), Paiute Indian Tribe of Utah (PITU), Duckwater Shoshone Tribe, and the Natural Resource Conservation Service (NRCS). In general, the responders had no comments or supported the project's goal to reducing flood risks. NDOW requested that any construction work avoided the breeding season for migratory bird species (April through July) and the NRCS identified two alternatives to consider (a low-water crossing and relocating the new bridge placement to the north on private property).

Step 3. *Identify and evaluate practicable alternatives to locating the proposed action in a floodplain or wetland (including the alternatives sites, actions and the "no action" option). If a* *practicable alternative exists outside the floodplain or wetland FEMA must locate the action at the alternative site.*

The subapplicant considered other alternatives in addition to the no action alternative to address practicable alternatives outside the floodplain. There is a need to maintain access to the State owned and operated Caliente Youth Center and the existing culvert access is within a floodway. By the very nature of the access crossing, there are no alternatives (those analyzed and those dismissed as unfeasible) that assures access that does not involve a built structure in the floodway. Based on this information, FEMA determined that the only practicable alternative is the proposed project.

Step 4. *Identify the potential direct and indirect impacts associated with the occupancy or modification of floodplains and wetlands and the potential direct and indirect support of floodplain and wetland development that could result from the proposed action.*

<u>Floodplains</u>

The purpose of the proposed project is to reduce flood risk and improve stream hydrologic and hydraulic processes. With the implementation of the proposed project, it is the intent to reduce the impacts of flooding by removing the Youth Center Drive culverts' impediment that artificially back up the flows in Clover Creek and create flooding impacts that would be almost nonexistent in a 100-year event. The proposed project would have positive direct and indirect influences within the floodway to streambed load balances, streambank stabilization, and establishment of native riparian vegetation.

<u>Wetlands</u>

During construction, Best Management Practices (BMPs) would be implemented to avoid erosion and sedimentation to protect the potential wetland as well as the surface waters of Clover Creek and Meadow Valley Wash. Erosion control measures would be applied to all exposed areas during construction, including the placement of silt fences or fiber rolls to prevent runoff to the surface waters. Restoration of disturbed soil areas would occur through the placement of mulch, seed, riprap and/or revegetation with native plant material based on the appropriate strategy for the specific location. All materials will be required to be certified weed free. Therefore, there would be no impacts to wetlands.

Step 5. *Minimize the potential adverse impacts and support to or within floodplains and wetlands to be identified under Step 4, restore and preserve the natural and beneficial values serve by the floodplains, and preserve and enhance the natural and beneficial values served by wetlands.*

As described in Step 4, the proposed project would not result in adverse impacts to the floodplain or wetlands. In fact, the proposed project would move this reach of Clover Creek closer to conditions that existed prior to the construction of the culverts for the Youth Center Drive crossing, moving the creek hydraulic conditions closer to more natural conditions.

Step 6. *Reevaluate the proposed action to determine first, if it is still practicable in light of its exposure to flood hazards, the extent to which it will aggravate the hazards to others, and its potential to disrupt floodplain and wetland values and second, if alternatives preliminarily rejected at Step 3 are practicable in light of the information gained in Steps 4 and 5. FEMA shall not act in a floodplain or wetland unless it is the only practicable location.*

As described in Step 3, there are no practicable alternatives to the proposed action. The proposed action would not result in adverse impacts to a floodplain or wetland.

Step 7. *Prepare and provide the public with a finding and public explanation of any final decision that the floodplain or wetland is the only practicable alternative.*

The subapplicant will publish a Final Public Notice for the proposed action in a local newspaper. The notice will include a description of the actions that would occur within the 100-year floodplain/floodway and why the proposed project was the only practicable alternative.

Step 8. *Review the implementation and post-implementation phases of the proposed project to ensure that the requirements are fully implemented. Oversight responsibility shall be integrated into existing processes.*

The subapplicant would be responsible for overseeing the implementation and post-implementation phases of the proposed project, including all identified BMPs.