



IN REPLY REFER TO:
L7615(YOSE-PM)

United States Department of the Interior

NATIONAL PARK SERVICE

Yosemite National Park
P. O. Box 577
Yosemite, California 95389

Memorandum

To: Lindsay Cline, Project Manager, Yosemite National Park

From: Superintendent, Yosemite National Park

Subject: NEPA and NHPA Clearance: 2013-013 Wawona Road Wildlife Crossing Structures for Pacific Fishers (46742)

The Executive Leadership Team has reviewed the proposed project and completed its environmental assessment documentation, and we have determined the following:

- There will not be any effect on threatened, endangered, or rare species and/or their critical habitat.
- There will be no historical properties affected.
- There will not be serious or long-term undesirable environmental or visual effects.

The subject proposed project, therefore, is now cleared for all NEPA and NHPA compliance requirements as presented above. Project plans and specifications are approved and construction and/or project implementation can commence.

For the proposed project actions to be within compliance requirements during construction and/or project implementation, the following mitigations must be adhered to:

- Continue consultation with the park historic architect regarding placement and anchoring of the passageway to avoid an adverse effect.
- Ensure that in the event that a culvert becomes plugged, the wildlife crossing structure is removed.

For complete compliance information see PEPC Project 46742.

//Don L. Neubacher//
Don L. Neubacher

Enclosure (with attachments)

cc: Statutory Compliance File

*The signed original of this document is on file at the
Environmental Planning and Compliance Office in
Yosemite National Park.*

Letter of Compliance
PEPC ID: 46742

s for Pacific Fishers -



National Park Service
U.S. Department of the Interior

Yosemite National Park
Date: 07/24/2013

Categorical Exclusion Form

Project: 2013-013 Wawona Road Wildlife Crossing Structures for Pacific Fishers

PEPC Project Number: 46742

Project Description:

This project is taking proactive measures to reduce Pacific fisher mortalities from vehicle collisions (road-kill) along Wawona Road by building innovative wildlife crossing structures that would facilitate safe animal movement. Pacific fishers are a candidate for listing under the federal Endangered Species Act (ESA), and recent camera research in the park indicates that a very small population exists in the southern portion of Yosemite, including the Mariposa Grove of Giant Sequoias, along Wawona Road near Chinquapin, and near Wawona. Fishers inhabiting this area of the southern Sierra Nevada are at the northernmost tip of their current range and must be able to safely cross the road on a regular basis if their population is to recover by expanding northward into historically occupied areas. Since 2007, six fisher road-kill mortalities have been recorded along Wawona Road, which bisects a narrow corridor of highly suitable fisher habitat. Within this same time period, three additional fishers have been killed by vehicles just south of the park on Highway 41 in Sierra National Forest. Wildlife crossing structures would provide a safer option for animals inhabiting this narrow corridor of suitable habitat to cross the road, and may help give this small fisher population its best chance at survival and potential recovery.

Using camera equipment from the 2009-2011 Yosemite Conservancy funded fisher study, the park has been actively monitoring several drainages with existing culverts along Wawona Road since fall 2011. These drainages act as wildlife movement corridors and serve as potential locations for wildlife crossing structures. Current camera work has shown fishers to be actively using three drainages along Wawona Road. Fishers are especially vulnerable to being hit by vehicles while crossing the road during denning season (March 1 – June 30) when females are searching for food and males are traveling large distances to locate potential mates.

This project would mitigate the road-kill threat by (1) modifying three existing culverts along Wawona Road to include a shelf-style wildlife crossing structure that small to medium sized mammals could use to safely cross underneath the road; and (2) include pre- and post-construction monitoring with remote, motion-sensing cameras to determine what wildlife species are using the drainages as movement corridors. This project is a diverse partnership with Defenders of Wildlife, the U.S. Forest Service, U.C. Berkeley Sierra Nevada Adaptive Management Project (SNAMP), Fisher Study, and the National Park Service. The timing of this project is important as the Pacific fisher's status will be reviewed for listing under the ESA in 2014.

Project Locations:

Mariposa County, CA

Categorical Exclusion Form - Wawona Road Wildlife Crossing Structures for Pacific Fishers - PEPC ID: 46742

Mitigations:

- Continue consultation with the park historic architect regarding placement and anchoring of the passageway to avoid an adverse effect.
- Ensure that in the event that a culvert becomes plugged, the wildlife crossing structure is removed.

Describe the category used to exclude action from further NEPA analysis and indicate the number of the category (see Section 3-4 of DO-12):

C.9 Repair, resurfacing, striping, installation of traffic control devices, repair/replacement of guardrails, etc., on existing roads.

On the basis of the environmental impact information in the statutory compliance file, with which I am familiar, I am categorically excluding the described project from further NEPA analysis. No exceptional circumstances (e.g. all boxes in the ESF are marked "no") or conditions in Section 3-6 apply, and the action is fully described in Section 3-4 of DO-12.

Superintendent: //Don L. Neubacher// **Date:** 8/1/13
Don L. Neubacher

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Yosemite National Park.*



ENVIRONMENTAL SCREENING FORM (ESF)

DO-12 APPENDIX 1

Date Form Initiated: 07/24/2013

Updated May 2007 - per 2004 Departmental Manual revisions and proposed Director's Order 12 changes

A. PROJECT INFORMATION

Park Name: Yosemite National Park
Project Title: 2013-013 Wawona Road Wildlife Crossing Structures for Pacific Fishers
PEPC Project Number: 46742
Project Type: YC Grant (OTHER)
Project Location:
County, State: Mariposa, California
Project Leader: Lindsay Cline

Is project a hot topic (controversial or sensitive issues that should be brought to attention of Regional Director)? No

B. RESOURCE EFFECTS TO CONSIDER:

Identify potential effects to the following physical, natural, or cultural resources	No Effect	Negligible Effects	Minor Effects	Exceeds Minor Effects	Data Needed to Determine/Notes
1. Geologic resources – soils, bedrock, streambeds, etc.	No				
2. From geohazards	No				
3. Air quality	No				
4. Soundscapes	No				
5. Water quality or quantity	No				
6. Streamflow		Negligible			Facilities management staff will review design drawings to ensure structure

Environmental Screening Form (ESF) - Wawona Road Wildlife Crossing Structures for Pacific Fishers - PEPC ID: 46742

Identify potential effects to the following physical, natural, or cultural resources	No Effect	Negligible Effects	Minor Effects	Exceeds Minor Effects	Data Needed to Determine/Notes
characteristics					placement does not affect the flow capacity of the creeks. Crest stage gages would be installed to monitor maximum water level at each modified culvert.
7. Marine or estuarine resources	No				
8. Floodplains or wetlands	No				
9. Land use, including occupancy, income, values, ownership, type of use	No				
10. Rare or unusual vegetation – old growth timber, riparian, alpine	No				
11. Species of special concern (plant or animal; state or federal listed or proposed for listing) or their habitat	No				The wildlife crossing structures will have a positive effect on the Pacific fisher, a federal ESA candidate.
12. Unique ecosystems, biosphere reserves, World Heritage Sites	No				
13. Unique or important wildlife or wildlife habitat	No				
14. Unique or important fish or fish habitat	No				
15. Introduce or promote non-native species (plant or	No				

Identify potential effects to the following physical, natural, or cultural resources	No Effect	Negligible Effects	Minor Effects	Exceeds Minor Effects	Data Needed to Determine/Notes
animal)					
16. Recreation resources, including supply, demand, visitation, activities, etc.	No				
17. Visitor experience, aesthetic resources	No				
18. Archeological resources	No				
19. Prehistoric/historic structure		Negligible			The culverts are potentially eligible historic resources. Details regarding placement and anchoring of the passageway shall be worked out in the field in consultation with Historical Landscape Architect to avoid an adverse effect.
20. Cultural landscapes	No				The wildlife crossings will not be seen from Wawona Road.
21. Ethnographic resources	No				
22. Museum collections (objects, specimens, and archival and manuscript collections)	No				
23. Socioeconomics, including employment, occupation, income changes, tax base, infrastructure	No				
24. Minority and low income populations, ethnography, size, migration patterns,	No				

Environmental Screening Form (ESF) - Wawona Road Wildlife Crossing Structures for Pacific Fishers - PEPC ID: 46742

Identify potential effects to the following physical, natural, or cultural resources	No Effect	Negligible Effects	Minor Effects	Exceeds Minor Effects	Data Needed to Determine/Notes
etc.					
25. Energy resources	No				
26. Other agency or tribal land use plans or policies	No				
27. Resource, including energy, conservation potential, sustainability	No				
28. Urban quality, gateway communities, etc.	No				
29. Long-term management of resources or land/resource productivity	No				
30. Other important environment resources (e.g. geothermal, paleontological resources)?	No				

C. MANDATORY CRITERIA

Mandatory Criteria: If implemented, would the proposal:	Yes	No	N/A	Comment or Data Needed to Determine
A. Have significant impacts on public health or safety?		No		
B. Have significant impacts on such natural resources and unique geographic characteristics as historic or cultural resources; park, recreation, or refuge lands; wilderness areas; wild or scenic rivers; national natural landmarks; sole or principal drinking water		No		

Mandatory Criteria: If implemented, would the proposal:	Yes	No	N/A	Comment or Data Needed to Determine
aquifers; prime farmlands; wetlands (Executive Order 11990); floodplains (Executive Order 11988); national monuments; migratory birds; and other ecologically significant or critical areas?				
C. Have highly controversial environmental effects or involve unresolved conflicts concerning alternative uses of available resources (NEPA section 102(2)(E))?		No		
D. Have highly uncertain and potentially significant environmental effects or involve unique or unknown environmental risks?		No		
E. Establish a precedent for future action or represent a decision in principle about future actions with potentially significant environmental effects?		No		
F. Have a direct relationship to other actions with individually insignificant, but cumulatively significant, environmental effects?		No		
G. Have significant impacts on properties listed or eligible for listing on the National Register of Historic Places, as determined by either the bureau or office?		No		
H. Have significant impacts on species listed or proposed to be listed on the List of Endangered or Threatened Species, or have significant impacts on designated Critical Habitat for these species?		No		
I. Violate a federal law, or a state, local, or tribal law or requirement imposed for the protection of the environment?		No		

Mandatory Criteria: If implemented, would the proposal:	Yes	No	N/A	Comment or Data Needed to Determine
J. Have a disproportionately high and adverse effect on low income or minority populations (Executive Order 12898)?		No		
K. Limit access to and ceremonial use of Indian sacred sites on federal lands by Indian religious practitioners or significantly adversely affect the physical integrity of such sacred sites (Executive Order 13007)?		No		
L. Contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species known to occur in the area or actions that may promote the introduction, growth, or expansion of the range of such species (Federal Noxious Weed Control Act and Executive Order 13112)?		No		

D. OTHER INFORMATION

1. Are personnel preparing this form familiar with the site? Yes
- 1.A. Did personnel conduct a site visit? No
2. Is the project in an approved plan such as a General Management Plan or an Implementation Plan with an accompanying NEPA document? No
3. Are there any interested or affected agencies or parties? Yes
- 3.A. Did you make a diligent effort to contact them? Yes
4. Has consultation with all affected agencies or tribes been completed? No
5. Are there any connected, cumulative, or similar actions as part of the proposed action? (*e.g., other development projects in area or identified in GMP, adequate/available utilities to accomplish project*) No

E. INTERDISCIPLINARY TEAM SIGNATORIES

<u>Interdisciplinary Team</u>	<u>Field of Expertise</u>
Don L. Neubacher	Superintendent
Michael Gauthier	Chief of Staff
Kathleen Morse	Chief of Planning
Randy Fong	Chief of Project Management
Teri Austin	Chief of Administration Management
Ed Walls	Chief of Facilities Management
Linda C. Mazzu	Chief of Resources Management & Science
Kris Kirby	Chief of Business and Revenue Management
Tom Medema	Chief of Interpretation and Education
Kevin Killian	Acting Chief of Visitor and Resource Protection
Lindsay Cline	Project Leader
Madelyn Ruffner	Acting Environmental Planning and Compliance Program Manager
Renea Kennec	NEPA Specialist

F. SUPERVISORY SIGNATORY

Based on the environmental impact information contained in the statutory compliance file and in this environmental screening form, environmental documentation for this stage of the subject project is complete.

Recommended:

Compliance Specialists	Date
<u>//Renea Kennec//</u> Compliance Specialist – Renea Kennec	<u>7/29/13</u>
<u>//Madelyn Ruffner//</u> Acting Compliance Program Manager – Madelyn Ruffner	<u>7/29/13</u>
<u>//Michael Wichmann//</u> Chief, Project Management – Randy Fong	<u>7/30/13</u>

Approved:

Superintendent	Date
<u>//Don L. Neubacher//</u> Don L. Neubacher	<u>8/1/13</u>

*The signed original of this document is on file at the
Environmental Planning and Compliance Office in
Yosemite National Park.*



PARK ESF ADDENDUM

Today's Date: July 24, 2013

PROJECT INFORMATION

Park Name: Yosemite National Park
Project Title: 2013-013 Wawona Road Wildlife Crossing Structures for Pacific Fishers
PEPC Project Number: 46742
Project Type: YC Grant (OTHER)
Project Location:
 County, State: Mariposa, California
Project Leader: Lindsay Cline

PARK ESF ADDENDUM QUESTIONS & ANSWERS

ESF Addendum Questions	Yes	No	N/A	Data Needed to Determine/Notes
SPECIAL STATUS SPECIES CHECKLIST				
Listed or proposed threatened or endangered species (Federal or State)?	Yes			The Pacific fisher is a federal candidate species.
Species of special concern (Federal or State)?	Yes			The Pacific fisher is a California species of concern.
Park rare plants or vegetation?		No		
Potential habitat for any special-status species listed above?		No		
NATIONAL HISTORIC PRESERVATION ACT CHECKLIST				
Entail ground disturbance?		No		
Are any archeological or ethnographic sites located within the area of potential effect?		No		
Entail alteration of a historic structure or cultural landscape?	Yes			The culverts are potentially eligible historic resources. Details regarding placement and anchoring of the passageway shall be worked out in the field in

ESF Addendum Questions	Yes	No	N/A	Data Needed to Determine/Notes
				consultation with Historical Landscape Architect to avoid an adverse effect
Has a National Register form been completed?		No		
Are there any structures on the park's List of Classified Structures in the area of potential effect?		No		
WILD AND SCENIC RIVERS ACT CHECKLIST				
Fall within a wild and scenic river corridor?		No		
Fall within the bed and banks AND will affect the free-flow of the river?		No		
Have the possibility of affecting water quality of the area?		No		
Remain consistent with its river segment classification?				
Fall on a tributary of a Wild and Scenic River?	Yes			Avalanche, Indian, and Strawberry Creek are all tributaries to the Merced River.
Will the project encroach or intrude upon the Wild and Scenic River corridor?		No		
Will the project unreasonably diminish scenic, recreational, or fish and wildlife values?		No		
Consistent with the provisions in the Merced River Plan Settlement Agreement?			N/A	
WILDERNESS ACT CHECKLIST				
Within designated Wilderness?		No		
Within a Potential Wilderness Addition?		No		



ASSESSMENT OF ACTIONS HAVING AN EFFECT ON CULTURAL RESOURCES

A. DESCRIPTION OF UNDERTAKING

1. **Park:** Yosemite National Park

2. **Project Description:**

Project Name: 2013-013 Wawona Road Wildlife Crossing Structures for Pacific Fishers

Prepared by: Laura Kirn

Date Prepared: 07/09/2013

Telephone: 209.379.1314

PEPC Project Number: 46742

Area of potential effects (as defined in 36 CFR 800.16[d])

APE is in the immediate vicinity around three culverts which cross beneath the Wawona Road. These culverts are located at Alder, Bishop, and Strawberry, Avalanche, and Indian Creeks.

3. **Has the area of potential effects been surveyed to identify historic properties?**

No

Yes

Source or reference: The Wawona Road is identified as a potential historic property, although no formal DOE or documentation has occurred.

4. **Potentially Affected Resource(s):** None

Historical Structures/Resources Notes: Historic rock work at culvert openings.

5. **The proposed action will: (check as many as apply)**

Yes Destroy, remove, or alter features/elements from a historic structure

No Replace historic features/elements in kind

Yes Add non-historic features/elements to a historic structure

Alter or remove features/elements of a historic setting or environment

No (inc. terrain)

Yes Add non-historic features/elements (inc. visual, audible, or atmospheric)

- to a historic setting or cultural landscape
- No Disturb, destroy, or make archeological resources inaccessible
- No Disturb, destroy, or make ethnographic resources inaccessible
- No Potentially affect presently unidentified cultural resources
- No Begin or contribute to deterioration of historic features, terrain, setting, landscape elements, or archeological or ethnographic resources
- No Involve a real property transaction (exchange, sale, or lease of land or structures)
- Other (please specify): _____

6. Supporting Study Data:

(Attach if feasible; if action is in a plan, EA or EIS, give name and project or page number.)

B. REVIEWS BY CULTURAL RESOURCE SPECIALISTS

The park 106 coordinator requested review by the park's cultural resource specialist/advisors as indicated by check-off boxes or as follows:

Archeologist
 Name: Sonny Montague
 Date: 06/11/2013

Check if project does not involve ground disturbance
 Assessment of Effect: No Potential to Cause Effect No Historic Properties
 Affected No Adverse Effect Adverse Effect Streamlined Review
 Recommendations for conditions or stipulations:

Historical Architect
 Name: Gabrielle Harlan
 Date: 07/03/2013

Check if project does not involve ground disturbance
 Assessment of Effect: No Potential to Cause Effect No Historic Properties
 Affected No Adverse Effect Adverse Effect Streamlined Review
 Recommendations for conditions or stipulations: The culverts are potentially eligible historic resources. Details regarding placement and anchoring of the passageway shall be worked out in the field in consultation with Historical Landscape Architect to avoid an adverse effect
 Doc Method: Park Specific Programmatic Agreement

Anthropologist
 Name: Jennifer Hardin
 Date: 07/09/2013

Check if project does not involve ground disturbance
 Assessment of Effect: No Potential to Cause Effect No Historic Properties

Affected No Adverse Effect Adverse Effect Streamlined Review
Recommendations for conditions or stipulations:

[X] Historical Landscape Architect
Name: Kevin McCardle
Date: 04/15/2013

Check if project does not involve ground disturbance []
Assessment of Effect: No Potential to Cause Effect No Historic Properties
Affected No Adverse Effect Adverse Effect Streamlined Review
Recommendations for conditions or stipulations: Details regarding placement and anchoring of the
passageway will be worked out in the field with park Historical Landscape Architect to avoid an adverse
effect.

Doc Method: Stipulations/Conditions

No Reviews From: Curator, Historian, 106 Advisor, Other Advisor

C. PARK SECTION 106 COORDINATOR'S REVIEW AND RECOMMENDATIONS

1. Assessment of Effect:

- No Potential to Cause Effects
- No Historic Properties Affected
- No Adverse Effect
- Adverse Effect

2. Documentation Method:

[] A. STANDARD 36 CFR PART 800 CONSULTATION
Further consultation under 36 CFR Part 800 is needed.

[] B. STREAMLINED REVIEW UNDER THE 2008 SERVICEWIDE PROGRAMMATIC
AGREEMENT (PA)

The above action meets all conditions for a streamlined review under section III of the 2008
Servicewide PA for Section 106 compliance.

APPLICABLE STREAMLINED REVIEW Criteria
(Specify 1-16 of the list of streamlined review criteria.)

[] C. PLAN-RELATED UNDERTAKING

Consultation and review of the proposed undertaking were completed in the context of a plan review
process, in accordance with the 2008 Servicewide PA and 36 CFR Part 800.
Specify plan/EA/EIS:

Assessment of Effect Form - Wawona Road Wildlife Crossing Structures for Pacific Fishers - PEPC ID:
46742

D. UNDERTAKING RELATED TO ANOTHER AGREEMENT

The proposed undertaking is covered for Section 106 purposes under another document such as a statewide agreement established in accord with 36 CFR 800.7 or counterpart regulations.

Specify: **1999 Programmatic Agreement**

E. COMBINED NEPA/NHPA Document

Documentation is required for the preparation of an EA/FONSI or an EIS/ROD has been developed and used so as also to meet the requirements of 36 CFR 800.3 through 800.6

G. Memo to SHPO/THPO

H. Memo to ACHP

3. Additional Consulting Parties Information:

Additional Consulting Parties: No

4. Stipulations and Conditions:

Following are listed any stipulations or conditions necessary to ensure that the assessment of effect above is consistent with 36 CFR Part 800 criteria of effect or to avoid or reduce potential adverse effects.

5. Mitigations/Treatment Measures:

**Measures to prevent or minimize loss or impairment of historic/prehistoric properties:
(Remember that setting, location, and use may be relevant.)**

- **Assessment of Effect - Historic Structures - Continue consultation with the park historic architect regarding placement and anchoring of the passageway to avoid an adverse effect.**

D. RECOMMENDED BY PARK SECTION 106 COORDINATOR:

Acting Historic Preservation Officer:

Kimball

Koch

//Kimball Koch//

Date: 7/30/13

E. SUPERINTENDENT'S APPROVAL

The proposed work conforms to the NPS *Management Policies and Cultural Resource Management Guideline*, and I have reviewed and approve the recommendations, stipulations, or conditions noted in Section C of this form.

Superintendent: //Don L. Neubacher//

Date: 8/1/13

Don L. Neubacher

Assessment
46742

*The signed original of this document is on file at the
Environmental Planning and Compliance Office in
Yosemite National Park.*

for Pacific Fishers - PEPC ID:

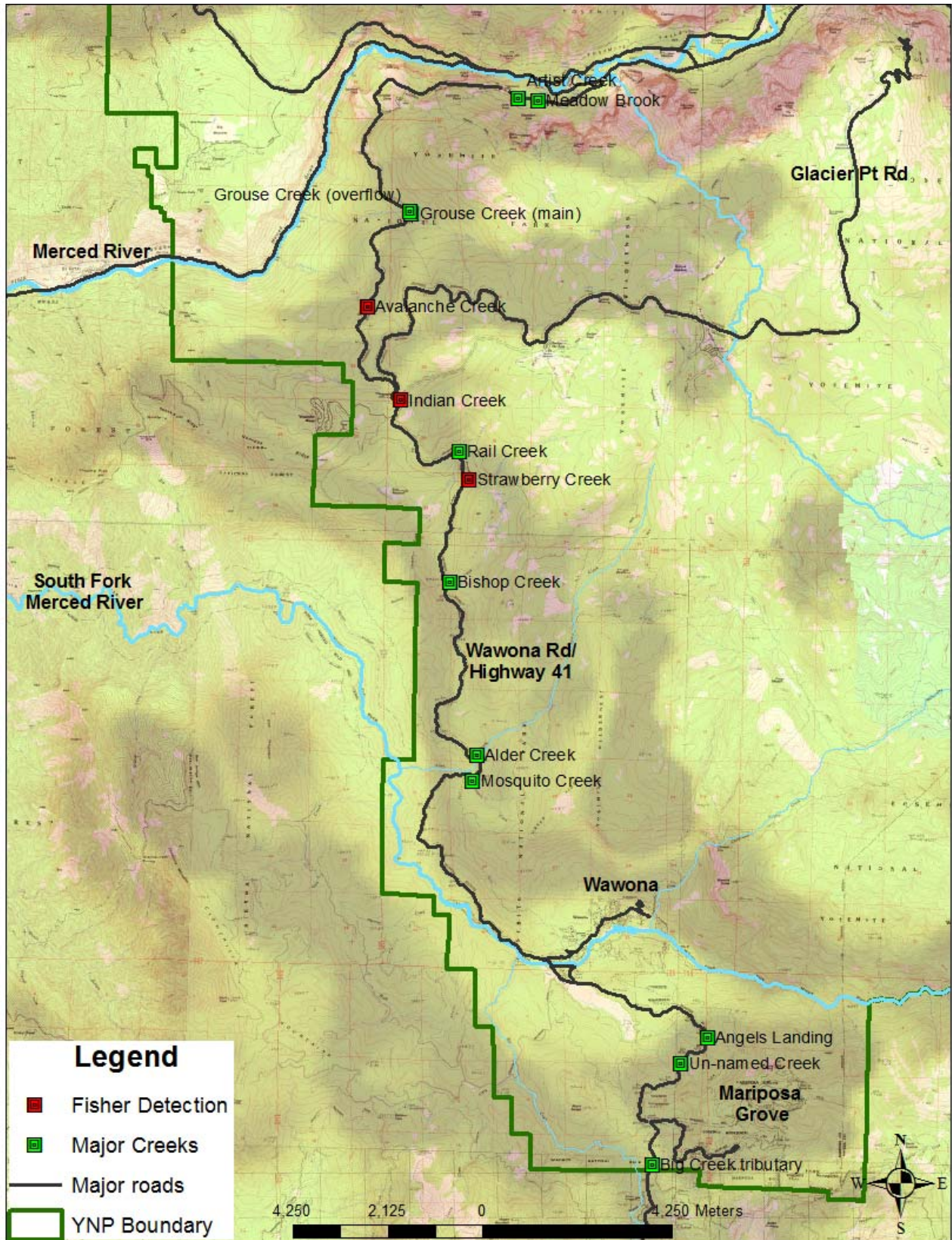


Figure 1. Potential wildlife crossing structure locations in culverts at major creeks along Wawona Road, Yosemite National Park. Culverts have been monitored with remote cameras since fall 2011, and fishers have been detected at three creeks (red squares), with the most recent detection occurring at Indian Creek in January 2013. Culverts considered for shelf-style crossing structures include Avalanche, Bishop, and Alder Creeks. Faded brown areas indicate high quality fisher habitat according to Spencer et al. (2008).

The following photos are of proposed wildlife crossing structure locations and their adjacent staging areas. Each concrete box culvert would house a shelf-style crossing structure.



Avalanche Creek E



Avalanche Creek W



Avalanche Creek Staging Area – NE of drainage
Alternatively, there is large pullout NW of drainage.



Bishop Creek E



Bishop Creek W



Bishop Creek Staging Area – SE of drainage.
Alternatively, there is large pullout NW of drainage.



Alder Creek E



Alder Creek W



Alder Creek Staging Area – SW of drainage



Example of crest stage gage to be installed at each culvert with crossing structure. Photo courtesy of Paul Rydlund.

HOT SHEET 10: MODIFIED CULVERT

GENERAL DESIGN

A crossing that is adaptively designed for use primarily by small and medium-sized wildlife associated with riparian habitats or irrigation canals. Designs to adapt canal bridges for wildlife crossings can take many forms. Dry platforms or walkways are typically constructed on the lateral interior walls of the bridge and above the high-water mark illustrated in Figure 54. Ramps from adjacent habitat and dry ground lead to the dry, elevated walkways inside the drainage structure.

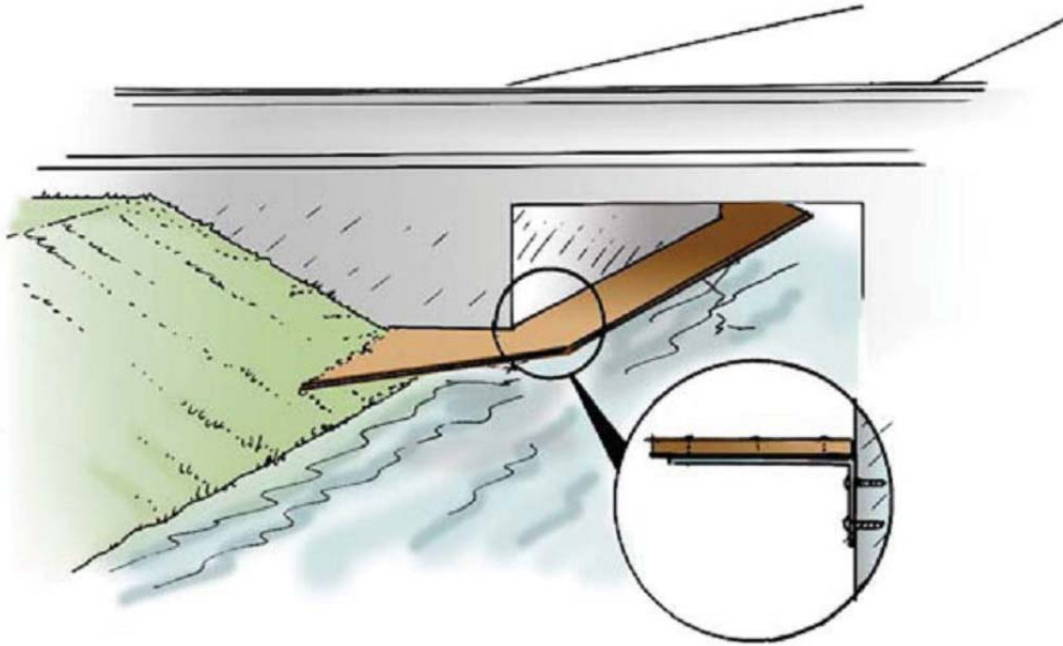


Figure 54. Schematic. Modified culvert (Reprinted with permission from Kruidering et al. 2005).

USE OF THE STRUCTURE

Movement of water and wildlife

GENERAL GUIDELINES

Appendix C – Hot Sheet 10: Modified Culvert from U.S. Department of Transportation. Federal Highway Administration. Wildlife Crossing Structure Handbook. Design and Evaluation in North America. Central Federal Lands Highway Division, Lakewood, CO. March 2011. 211 pp. Publication No. FHWA-CFL/TD-11-003.

- Adapting drainages and canals for wildlife use is a cost-effective means to provide wildlife passage associated with wetlands and other habitats that are inundated year-round or seasonally.
- There is generally little human activity in these areas; nonetheless, to ensure performance and function a modified culvert should have minimal human disturbance.
- Little modifications are needed to adapt canal bridges for wildlife passage. Platforms made of sturdy materials (corrugated metal is not recommended) such as galvanized steel, concrete or wooden boards (“2 x 10s”) work well. It is important to keep the walkway platforms dry, above the high-water mark and accessible from adjacent dry habitat.
- Any work to adapt a bridge structure for wildlife passage should not impede or reduce the bridges hydrologic capacity or function.

DIMENSIONS - GENERAL GUIDELINES

- The dimensions of bridges for carrying water are a function of the hydrologic condition and needs of the area.
- Design and dimensions of walkways for wildlife will vary depending on the target species.
- Walkways: Recommended minimum > 1.5 ft (0.5 m) wide.
- Access ramps: Recommended <30 degrees slope.

TYPES OF CONSTRUCTION

- Concrete bottomless arch
- Prefabricated concrete box culvert
- Circular multi-plate metal culvert (these are least recommended, but can be adapted for wildlife passage using pre-fabricated metal shelves with service ramps (see Foresman 2003).

SUGGESTED DESIGN DETAILS

Crossing structure

- Structures should be designed to meet the movement needs of widest range of riparian associated species that live in the area or might be expected to recolonize area.
- Wildlife walkways should run along both sides of the canal bridge. Walkways can be placed on only one side of the bridge interior in situations where wildlife habitat was primarily on one side of the bridge.

Local habitat management

- Attempt to provide continuous habitat leading to an adjacent to the structure. Re-vegetation of area may be needed after construction to restore habitat conditions.

Appendix C – Hot Sheet 10: Modified Culvert from U.S. Department of Transportation. Federal Highway Administration. Wildlife Crossing Structure Handbook. Design and Evaluation in North America. Central Federal Lands Highway Division, Lakewood, CO. March 2011. 211 pp. Publication No. FHWA-CFL/TD-11-003.

- Encourage use of structure by using fencing, rock walls, or other barriers along road to direct wildlife into the modified culvert. Use topography and natural features as much as possible.
- If traffic volume is high on the road above the modified culvert it is recommended that sound attenuating walls be placed above the entrance to reduce noise and light disturbance from passing vehicles.

POSSIBLE VARIATIONS

- Concrete platforms or walkways as an integral part of canal bridge structure.
- Platforms made of 2 in x 10 in wooden boards anchored to the interior wall of the structure.
- Pre-fabricated galvanized steel or metal shelves with service ramps installed in existing drainage culverts and bridges.

MAINTENANCE

- Periodic visits should be made to ensure that there is proper access, there are no material defects, or any obstacles in or near the underpass that might affect wildlife use. Checks should be made regularly but also after heavy rain events.
- Fences or other materials used to guide wildlife to the crossing should be checked, maintained and repaired periodically.

SPECIES-SPECIFIC GUIDELINES

Recommended/Optimum solution for wildlife species/groups

Carnivores

- Fisher, Marten, Weasel sp. – Species adaptable in habitat use and associated with a mix of habitat types, including riparian habitats (especially Fisher). Use of modified culverts is likely if located in or near riparian habitats where they reside.

Low mobility medium-sized mammals

- To encourage use from these species, structures should be placed in or near habitats where they are found.

Semi-aquatic mammals

- Mink, River Otter, Muskrats and other riparian-associated species are ideal species for use of a modified culvert, particularly if situated in or near riparian habitat.

Small mammals – (same as above for *Low mobility medium-sized mammals*)

Amphibians

- Efforts should be made to site underpass structure in known routes of seasonal migration, dispersal or other movement events for the target species. Not likely to

Appendix C – Hot Sheet 10: Modified Culvert from U.S. Department of Transportation. Federal Highway Administration. Wildlife Crossing Structure Handbook. Design and Evaluation in North America. Central Federal Lands Highway Division, Lakewood, CO. March 2011. 211 pp. Publication No. FHWA-CFL/TD-11-003.

use structure unless located in migratory route or in general area where dispersal may occur.

Reptiles – (same as above for *Low mobility medium-sized mammals*)

Possible if adapted

Carnivores

- Coyote, Fox1, Bobcat – Species adapted to range of habitat types, including riparian and wetlands. Modified culverts should be designed to provide for wide walkways for these species when located in or near habitats they are found.
- Fox2 – Species adapted to arid, open and agricultural habitats, occasionally with irrigation canals. Few documented cases of Swift/Kit Foxes using a range of wildlife crossing sizes, but generally avoid them preferring to cross at grade-level. Artificial dens should be installed near entrances to provide escape cover for Swift/Kit Foxes.

Not recommended or applicable

Ungulates

- Moose, Elk, Deer, Pronghorn, Bighorn Sheep, Mountain Goat

Carnivores

- Black Bear, Grizzly Bear, Wolf, Cougar, Lynx, Wolverine, Badger

Semi-arboreal mammals – all species.

Unknown – more data are required

None