2018 Monitoring Report for Stream-Crossing Projects with Determination of "May Affect, Likely to Adversely Affect" the Topeka Shiner

In Compliance with Terms and Conditions Related to
Topeka Shiner Reasonable and Prudent Measure 4:
Biological Opinion for Stream-Crossing Projects Administered/Funded by the South Dakota Department of Transportation and the Federal Highway Administration

By:

Environmental Office
South Dakota Department of Transportation
March 2019

Submitted to:

United States Fish and Wildlife Service
Mountain-Prairie Region 6
South Dakota Ecological Services Office
Pierre, SD

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Introduction:

RPM four in the *2008 Programmatic Biological Opinion* refers to the monitoring of all replaced structures found to "Adversely Affect" Topeka shiners. The Monitoring Program Plan "*South Dakota Fish Passage Monitoring Protocol for Projects Regulated by the 2008 Programmatic Biological Opinion: Stream Crossing Projects Administered/Funded by the South Dakota Department of Transportation and the Federal Highway Administration*" was completed and approved by FWS, FHWA, and SDDOT in July 2012. After approval of the Monitoring Program Plan, representatives from FWS, FHWA, and SDDOT continued to discuss and revise data collection methods and guidelines. In October 2012, this multiagency group agreed upon a set of data collection guidelines and a '*SDDOT Fish Passage Assessment Work Sheet*' for use beginning in November 2012.

Monitoring Overview:

Monitoring of 34 structures with a determination of 'May Affect, Likely to Adversely Affect' Topeka shiners, which were constructed 2009 – 2011, was completed in November 2012, shortly after the multiagency group agreed upon a set of data collection guidelines. As indicated in the Monitoring Plan, the FWS, FHWA, and SDDOT met on April 11, 2013 to review findings from the Monitoring Report for 2012. During this meeting the group also evaluated effectiveness of the data being collected on the '*SDDOT Fish Passage Assessment Work Sheet*'. Revisions to sampling methods, and structures of concern were discussed. It was determined that measuring stream velocities

at bridge sites was no longer necessary. Measurements recorded at culverts and pipes would remain the same.

Drought conditions during the first two years of monitoring (2012, 2013) resulted in several box culvert sites where water levels and/or stream velocities were too low to record velocities. Concerns were expressed by some members of the multiagency group (April 11, 2013) regarding the lack of stream velocity measurements at many structures due to low water levels. As a result, the decision was made after the 2013 monitoring season to move the monitoring schedule in 2014 to approximately three weeks earlier. It was hoped that starting in early June instead of early July would allow monitoring during higher water flows, therefore allowing velocities to be measured.

Monitoring earlier in 2014 did allow velocities to be recorded more frequently. However, because water depths were greater, water levels were then too high to obtain visual observations of sediment deposition along the bottom or sides of culverts. The inability to obtain visual observations of the structure floor zone also prevented evaluating if low-flow sinuous channels were developing within many box culverts. Assessing channel and streambed conditions and assessing how the structure is functioning with regards to fish passage during low flows are primary goals of the Monitoring Plan. In addition, the monitoring plan states "monitoring in the late summer or fall will take place to adequately assess channel and streambed conditions resulting from the past seasonal flows." This task cannot be completed effectively when water levels are too high to visually observe the substrate within the structure. As a result, we returned to the original July monitoring period in 2015. Since water levels were lower in July 2015 than during June 2014, stream velocities were recorded at fewer structures.

However, because water levels were lower in July 2015 than during June 2014, SDDOT environmental staff could more readily observe sediment deposition and development of low-flow channels developing within structures. Observers were also to more accurately access if riprap created barriers to fish passage during low-flow periods. We have continued with the mid-late July monitoring period every year since 2015. We plan to continue with the mid-late July monitoring period in 2019.

During the first six years of post-construction monitoring at stream-crossing projects that "May Affect, and are Likely to Adversely Affect" Topeka shiners, stream velocity measurements did not appear to provide meaningful data. During low flow periods when monitoring is scheduled, stream velocity is unlikely to be a factor limiting upstream fish passage. In addition, highest velocities in multi-barrel culverts were often not within the same barrel, casting doubt on the theory that thalweg development in structures could be located exclusively with velocity measurements. As a result, the decision was made by the multiagency group at the 2015 Monitoring Report follow-up meeting to no longer require measurements of stream velocity as part of the monitoring protocol. However, USFWS did request continuing stream velocity measurements whenever schedules allowed. The SDDOT and FHWA representatives agreed to the request. Therefore, stream velocities were only recorded at box culverts as time allowed in 2016, 2017, and 2018.

2018 Monitoring:

In 2018 a total of 41 structures with a determination of 'May Affect, Likely to Adversely Affect' Topeka shiners were monitored (Table 1). Of the 41 total structures monitored in 2018, nine structures were monitored for the first-time post-construction.

Five of the nine new structure projects monitored were new bridges, three were new box culverts, and one was a scour protection at existing bridges.

In addition, twenty structures initially monitored in 2016 were re-monitored as part of their scheduled evaluation in the third year after construction or development of the Monitoring Program Plan "***South Dakota Fish Passage Monitoring Protocol for Projects Regulated by the 2008 Programmatic Biological Opinion: Stream Crossing Projects Administered/Funded by the South Dakota Department of Transportation and the Federal Highway Administration***".

Twelve structures initially monitored in 2014 were re-monitored as part of their scheduled evaluation in the fifth year after construction or development of the Monitoring Program Plan.

As a condition of the Monitoring Plan, the *Monitoring Report for 2018* is submitted along with the *Annual Compliance Report for2018*. Within one month of distribution of the *Annual Compliance Report* (or other time agreed to by all parties), the FWS, FHWA, and SDDOT will meet to review the 2018 Monitoring Report findings. Revisions will be discussed and implemented as needed to meet the terms and conditions of the 2008 Biological Opinion.

Analysis:

In 2018, a total of 41 structures with a determination of 'May Affect, Likely to Adversely Affect' Topeka shiners were monitored as a condition of the Monitoring Plan. Of these 41 structures, 11 were bridge replacements; 17 were box culverts; 11 were scour protection projects at existing bridges; and two were reinforced concrete arch pipes. One Interstate 90 bridge replacement project (PCN 021X, structure 50-285-166), completed in 2017, was not monitored in 2018, and is not included in this report. The twin structure (PCN 021X, structure 50-285-165) was still under construction during the summer of 2018. As a result, the entire vicinity was an active construction zone, which we determined was unsafe for monitoring activities. Both structures 50-285-166 and 50-285-165 will be monitored in 2019 and will appear in the 2019 Monitoring Report.

Bridge Projects:

Eleven bridges were monitored in 2018 (Table 1). Five bridges were monitored in 2018 for the first time. Five bridges had initially been monitored in 2016 and were due for scheduled third-year evaluation as a condition of the Monitoring Plan. One new bridge had initially been monitored in 2014 and was due for scheduled fifth-year evaluation as a condition of the Monitoring Plan.

Monitoring indicated that the *Biological Opinion*'s terms and conditions (TCs) related to Topeka shiner Reasonable and Prudent Measures (RPMs) 1 (habitat fragmentation/fish passage), and 3 (sediment & erosion controls and minimization of construction footprint) were complied with on 100% of 2018 monitored bridge sites.

Problems Detected:

No potential fish passage problems were observed at any of the eleven bridge replacement project sites monitored in 2018.

Corrective Actions:

No corrective actions were necessary for any of the eleven bridge replacement project sites monitored in 2018.

Box Culvert Projects:

Seventeen box culverts were monitored in 2018 (Table 1). Three culverts were monitored for the first time in 2018. Eleven box culverts had initially been monitored in 2016 and were due for scheduled third-year evaluation as a condition of the Monitoring Plan. The remaining three box culverts had initially been monitored in 2014 and were due for scheduled fifth-year evaluation as a condition of the Monitoring Plan.

Monitoring indicated that the *Biological Opinion*'s TCs related to RPMs 1 (habitat fragmentation/fish passage), and 3 (sediment & erosion controls and minimization of construction footprint) were now complied with on 94% of box culvert replacement projects monitored in 2018. The one project that may not comply with the *Biological Opinion* (sediment & erosion controls and minimization of construction footprint) was Spink County box culvert 58-356-420.

Problems Detected:

Spink County structure 58-356-420 is a box culvert constructed in 2013. A scour hole has developed just upstream of the inlet apron. The scour hole is not likely to present a barrier to fish passage, but it has the potential to impact normal stream

development. In addition, if the scour expands downstream, it could adversely affect the box culvert.

Corrective Actions:

A corrective action plan for repairing the scour hole, while not creating a fish passage barrier with excessive riprap should be developed. The corrective action plan should then be reviewed at the 2018 Monitoring Report follow-up meeting by the multiagency group. Completing corrective measures at box culvert Spink 58-356-420 is a goal for 2019.

Concrete Pipe Projects:

Two concrete arch pipes initially monitored in 2016 were inspected for their scheduled third-year evaluations as a condition of the Monitoring Plan. Monitoring indicated that the *Biological Opinion*'s terms and conditions (TCs) related to Topeka shiner Reasonable and Prudent Measures (RPMs) 1 (habitat fragmentation/fish passage), and 3 (sediment & erosion controls and minimization of construction footprint) were complied with on 100% of 2018 monitored concrete pipe sites.

Problems Detected:

No potential fish passage problems were observed at either structure. Potential for erosion exists at the upstream end of McCook County unnamed structure on a tributary to Wolf Creek, since the inlet begins at the edge of a row crop field (currently soybeans). Neither of the two (McCook County PCN 03T6) sites exhibit bed-and-bank characteristics of a stream. While it is possible these sites are ephemeral streams during

wet seasons, it is questionable whether either of these tributary stretches provide suitable habitat for Topeka shiners. Therefore, the possibility exists that neither project should have been appended to the Biological Opinion.

Corrective Actions:

During the 2018 Monitoring Report follow-up meeting, the multiagency group should discuss whether these two structures merit monitoring as a condition of the Monitoring Plan.

Culvert/Pipe Extension Projects:

No culvert or pipe extension projects were monitored in 2018.

Problems Detected:

No culvert or pipe extension projects were monitored in 2018.

Corrective Actions:

No culvert or pipe extension projects were monitored in 2018.

Scour Protection Projects:

Eleven scour protection projects at existing bridges were monitored in 2018 (Table 1). One scour protection project was monitored for the first time. Two scour protection projects at bridges had initially been monitored in 2016 and were due for scheduled third-year evaluation as a condition of the Monitoring Plan. The remaining eight scour protection projects at bridges had initially been monitored in 2014 and were due for scheduled fifth-year evaluation as a condition of the Monitoring Plan. Monitoring indicated that the *Biological Opinion*'s TCs related to Topeka shiner RPMs 1

(habitat fragmentation/fish passage), and 3 (sediment & erosion controls and minimization of construction footprint) were complied with on 100% of projects monitored in 2018.

Problems Detected:

No potential fish passage problems were observed at any of the eleven scour protection project sites monitored in 2018.

Corrective Actions:

No corrective actions were necessary for any of the eleven scour protection project sites monitored in 2018.

Carry-over Projects:

1. Turner County, PCN 0243: Triple-pipe extension

Turner County PCN 0243 includes the extension of an unnamed triple-pipe structure completed in 2012 (reported in Monitoring Report for 2013, 2015, 2017). Since the original structure was not countersunk (built prior to Biological Opinion) and presented a barrier to fish passage, the extension of the original structure simply continued the problem. The triple pipes and associated riprap effectively create a 'perched' condition which prevents stream continuity and fish passage during all but the highest stream flows.

Corrective Actions:

Discussions with Wayne Stancill (USFWS) in 2016 and 2017 provided the possibility that the fish passage barrier at the Turner County triple-pipe extension could be mitigated by installing corrective measures on two of the three pipe inlets, and just

downstream of the existing structure. Mr. Stancill has since retired from USFWS and is no longer available to provide technical support. The SDDOT biologist will work with others on corrective measures design, then present corrective action plan to the multiagency group for approval. Completing corrective measures for this project is a goal for 2019.

2. Davison County box culvert 18-042-210

Davison County structure 18-042-210 is a box culvert constructed in 2012 which was not countersunk below calculated stream flowline elevations (reported in Monitoring Report for 2013, 2015, 2017). In addition, this structure presents a hindrance to fish passage and normal stream development, due to excess riprap upstream of the culvert.

Corrective Actions:

The multiagency group agreed that a riprap removal plan should be drafted. Discussion also included the possibility that the U.S. Army Corps of Engineers (COE) may not have realized or been informed of the extent of work prior to construction. The group determined that additional background information needed to be gathered from the original designer before proceeding further. Very little background information on this project, and why excessive riprap was installed appears available. No additional progress was made on corrective measures for this project in 2017 or 2018. The SDDOT biologist did contact the landowner who indicated that she had additional information (personal communications) from when this project was constructed. Completing corrective measures for this project is a goal for 2019.

3. Lincoln County bridge replacement 42-050-199

Structure 42-050-199 is a bridge crossing Saddle Creek in Lincoln County. Excessive riprap placed in the stream beneath the bridge was determined to potentially affect fish passage and stream development on Saddle Creek (Lincoln 42-050-199).

Corrective Actions:

A corrective action plan was developed and approved by the multiagency group. The SDDOT Yankton Area Office was contacted in 2016 to remove the excess riprap in Saddle Creek at Lincoln County structure 42-050-199. During a 2017 site visit, it was discovered that corrective action had not yet occurred. When contacted, the area office indicated they had forgotten and had misplaced the 2016 corrective action plan. The 2016 corrective action plan, along with additional photos from 2017 site visit were sent to the Yankton Area Office. The SDDOT biologist communicated with the Yankton Area Office twice in 2018 for updates on the corrective action. The Yankton Area Office provided the following statement in a 12/20/2018 email: "As you know we have had an abnormally wet year. I monitored this site all summer and fall and the water was too high all year to do the work. The water has finally went down and we have a Contractor ready to perform it." The Yankton Area Office contact estimated corrective action would occur sometime before April 2019. The SDDOT biologist will continue communications with the Yankton Area Office to insure the corrective action plan is completed in 2019. At least one additional year of monitoring will be required at this structure once corrective action is taken and photographic documentation provided.

Issues Requiring Possible Protocol or Sampling Changes:

During the most recent Monitoring Report follow-up meeting, measurement of sediment depths along cross -sections within box culverts was discussed. Members of the multiagency group suggested that more detailed sediment depth cross-sections could provide a more complete picture of low flow channel development and bathymetry within box culvert structures. Members of the group requested that the DOT biologist collect more detailed sediment depth cross-section data within box culverts. In 2016, 2017, and 2018, the DOT biologist collected more detailed sediment depth data across box culvert widths, to the greatest extent practical.

On November 19, 2018, the USFWS representative requested that the DOT biologist begin drafting modifications to the South Dakota Fish Passage Monitoring Protocol (2012). Several years of monitoring data (2012-2018) indicate that the 2012 Monitoring Protocol can be streamlined, reducing the time spent monitoring each structure. Data from six years of monitoring indicates that fish passage barriers are the primary negative impact observed at newly-completed stream-crossing projects. The SDDOT biologist continues to work on updating/revising the document for review by the multiagency group.

Table 1. Stream crossing projects where monitoring was conducted in 2018. All projects listed were assigned a determination of "May Affect, Likely to Adversely Affect" Topeka shiners. Twelve projects were initially monitored in 2014, and re-monitored for scheduled fifth year evaluation. Twenty projects were initially monitored in 2016, and re-monitored for scheduled third year evaluation. Nine projects were initially monitored in 2018.

PCN / Project Number	County	Structure Number	Structure Type	Stream	Compliance Report Year	First Monitoring	Potential Issues During 2018 Monitoring
02E1 / BRO8058(17)	Spink	58-099-251	Bridge	Turtle Creek	2017	2018	No issues. No fish passage barriers.
025C / P0115(47)102	Minnehaha	50-208-022	Bridge	Dells of Big Sioux River	2017	2018	No issues. No fish passage barriers.
01W8 / BRF6355(09)	Turner	63-070-041	Bridge	W. Fork – Vermillion River	2017	2018	No issues. No fish passage barriers.
01DY / BRF6397(03)	Union	64-050-060	Bridge	East Brule Creek	2017	2018	No issues. No fish passage barriers.
01WB / BRF6475(08)	Clay	14-130-011	Bridge	Ash Creek	2018	2018	This project was accidentally omitted from the 2017 Compliance Report, so is inserted into 2018 Compliance Report. No issues observed during monitoring. No fish passage barriers.
6867 / BRO8014(26)	Clay	14-110-056	Box Culvert	Unnamed Trib. to Vermillion River	2017	2018	No issues. Fish passage does not appear to be affected by culvert. Box is countersunk. Low flow channels and sediment deposition are present.
02T6 / BRO8003(23)	Beadle	03-055-280	Box Culvert	Unnamed creek	2017	2018	No issues. Fish passage does not appear to be affected by culvert. Box is countersunk.
02EV / BRO8056(13)	Sanborn	56-228-070	Box Culvert	West Redstone Creek	2017	2018	No issues. Fish passage does not appear to be affected by culvert. Box is countersunk.
022C / IM0295(35)127	Brookings	06-184-218 & 06-185-218	Scour Protection	Medary Creek	2017	2018	No issues. No fish passage barriers.
01W7 / BRO 8006(50)	Brookings	06-209-150	Bridge	Deer Creek	2015	2016	No issues. No fish passage barriers.
020S / BRF 6170(01)	Brown	07-010-070	Bridge	Elm River	2015	2016	No issues. No fish passage barriers.
034S / BRF 6251(06)	Brown	07-200-234	Bridge	Elm River	2015	2016	No issues. No fish passage barriers.
02RX / NH 0281(94)220	Brown	07-100-086	Bridge	Maple River	2015	2016	Erosion at road edge, but no effect on stream. Fish passage is not hindered.
02K2 / BRO 8042(39)	Lincoln	42-163-137	Bridge	Beaver Creek	2015	2016	No issues due to this project. Fish passage is not hindered.

PCN / Project Number	County	Structure Number	Structure Type	Stream	Compliance Report Year	First Monitoring	Potential Issues During 2018 Monitoring
025Z / P-PH 0019(31)73	Lake	40-149-155	Box Culvert	Park Creek	2015	2016	No issues. Fish passage does not appear to be affected by structure. Culvert is countersunk. Sediment deposition is present.
025Z / P-PH 0019(31)73	Lake	40-150-196	Box Culvert	Negro Creek	2015	2016	No issues. Fish passage does not appear to be affected by culvert. Box is countersunk. Low flow channels and sediment deposition are present.
025Z / P-PH 0019(31)73	Lake	40-150-210	Box Culvert	North Buffalo Creek	2015	2016	Fish passage barrier reported in 2016 was removed in 2017. No fish passage barriers remain. Culvert is countersunk. Low flow channels and sediment deposition are present.
025Z / P-PH 0019(31)73	Lake	40-150-239	Box Culvert	Tr. to Buffalo Lake	2015	2016	No issues. Fish passage does not appear to be affected by structure. Culvert is countersunk. Sediment deposition is present.
5319/ BRO 8042(29)	Lincoln	42-016-140	Box Culvert	Long Creek	2015	2016	No issues. Fish passage does not appear to be affected by culvert. Box is countersunk. Low flow channels and sediment deposition are present.
03T6 / P 0038(43)321	McCook	44-031-090	Box Culvert	Tr. to W. Fork Vermillion River	2015	2016	No issues. Fish passage does not appear to be affected by culvert. Culvert is countersunk.
025Z / P-PH 0019(31)73	Minnehaha	50-030-017	Box Culvert	Tr. to Buffalo Lake	2015	2016	No issues. Fish passage does not appear to be affected by structure. Culvert is countersunk. Sediment deposition is present.
025Z / P-PH 0019(31)73	Minnehaha	50-030-044	Box Culvert	Tr. to W. Br. of Skunk Creek	2015	2016	No issues. Fish passage does not appear to be affected by structure. Culvert is countersunk. Sediment deposition is present.
025Z / P-PH 0019(31)73	Minnehaha	50-030-049	Box Culvert	Tr. to W. Br. of Skunk Creek	2015	2016	No issues. Fish passage does not appear to be affected by culvert. Box is countersunk. Low flow channels and sediment deposition are present.
025Z / P-PH 0019(31)73	Minnehaha	50-030-052	Box Culvert	Tr. to W. Br. of Skunk Creek	2015	2016	No issues. Fish passage does not appear to be affected by culvert. Box is countersunk. Low flow channels and sediment deposition are present.
025Z / P-PH 0019(31)73	Minnehaha	50-030-065	Box Culvert	West Br. of Skunk Creek	2015	2016	No issues. Fish passage does not appear to be affected by culvert. Box is countersunk. Low flow channels and sediment deposition are present.

PCN / Project Number	County	Structure Number	Structure Type	Stream	Compliance Report Year	First Monitoring	Potential Issues During 2018 Monitoring
03T6 / P 0038(43)321	McCook	None – was 44-095-090	RCP Arch	Tr. to W. Fork Vermillion River	2015	2016	Question if this structure should be monitored. Fish passage is not hindered.
03T6 / P 0038(43)321	McCook	None	RCP Arch	Tr. to Wolf Creek	2015	2016	Question if this structure should be monitored. Fish passage is not hindered.
03A7 / NH 0281(97)85	Aurora	02-180-013	Scour Protection	Firesteel Creek	2015	2016	No issues. No fish passage barriers.
03A7 / NH 0281(97)85	Jerauld	37-239-014	Scour Protection	Sand Creek	2015	2016	No issues. No fish passage barriers.
02AA / P 0028(31)281	Spink	58-260-420	Bridge	Foster Creek	2013	2014	No issues due to this project. No fish passage barriers. Termination of monitoring proposed.
01XY / BRF 6221(14)	Davison	18-090-152	Box Culvert	Enemy Creek	2013	2014	No issues. Fish passage does not appear to be affected by culvert. Box is countersunk. Low flow channels and sediment deposition are present. Termination of monitoring proposed.
02AA / P 0028(31)281	Spink	58-356-420	Box Culvert	Shue Creek	2013	2014	Scour upstream of culvert. Fish passage barriers not present. Box is countersunk. Low flow channels and sediment deposits exist.
02AA / P 0028(31)281	Spink	58-222-420	Box Culvert	Unnamed Creek	2013	2014	No issues. Fish passage does not appear to be affected by culvert. Culvert is countersunk. Termination of monitoring proposed.
029U / BRF 0025(64)75	Miner	49-089-205	Scour Protection	Rock Creek	2013	2014	No issues. No fish passage barriers. Termination of monitoring proposed.
00RH / BRF0212(154)306	Spink	58-086-251	Scour Protection	Turtle Creek	2013	2014	No issues. No fish passage barriers. Termination of monitoring proposed.
039U / BRF 0281(96)154	Spink	58-095-249	Scour Protection	Turtle Creek	2013	2014	No issues. No fish passage barriers. Termination of monitoring proposed.
00LE / BRF 0020(98)334	Spink	58-231-060	Scour Protection	Dry Run Creek	2013	2014	No issues. No fish passage barriers. Termination of monitoring proposed.
00LE / BRF 0020(98)334	Spink	58-281-060	Scour Protection	Timber Creek	2013	2014	No issues. No fish passage barriers. Termination of monitoring proposed.
00LE / BRF 0020(98)334	Spink	58-300-068	Scour Protection	Tr. to Timber Creek	2013	2014	No issues. No fish passage barriers. Termination of monitoring proposed.
00LG / BRF0037(105)181	Spink	58-300-109	Scour Protection	Unnamed Creek	2013	2014	No issues. No fish passage barriers. Termination of monitoring proposed.
00LG / BRF0037(105)181	Spink	58-300-124	Scour Protection	Br. of Timber Creek	2013	2014	No issues. No fish passage barriers. Termination of monitoring proposed.

				CARRY-OVER PROJECTS			
PCN / Project Number	**County**	**Structure Number**	**Structure Type**	**Stream**	**Compliance Report Year**	**First Monitoring**	**Corrective Action Status**
01PO / P 6042(02)	Davison	18-042-210	Box Culvert	Trib. to 12 Mile Creek	2012	2013	Structure was not countersunk, but some sediment accumulating in bottom of culvert. Excessive riprap upstream of box is hindrance to fish passage and stream development. Corrective action plan to remove excess riprap is still needed.
0243 / P 019(33)31	Turner	None	3 Pipe Extension	Frog Creek	2012	2013	Structure is a hindrance to fish passage during low flow periods. DOT biologist is pursuing design for corrective measures.
6582 / BRO 8042(28)	Lincoln	42-050-199	Bridge	Saddle Creek	2010	2012	Fish passage barrier exists. Excessive riprap under and just west of bridge. Corrective action plan approved by USFWS and FHWA. Yankton Area Office has a contractor to remove excess riprap early in 2019.

Appendix I: South Dakota Fish Passage Monitoring Protocol

South Dakota Fish Passage Monitoring Protocol for Projects Regulated by the 2008 Programmatic Biological Opinion: Stream Crossing Projects Administered/Funded by the South Dakota Department of Transportation and the Federal Highway Administration

Office of Project Development-Environmental
South Dakota Department of Transportation
2012

Submitted to:

United States Fish and Wildlife Service
Mountain-Prairie Region 6
South Dakota Ecological Services Office
Pierre, SD

Background and Purpose:

Construction of bridges and culverts by South Dakota Department of Transportation (SDDOT) and the Federal Highway Administration (FHWA) have and will continue to affect the streams and rivers of South Dakota. In 2008, SDDOT, FHWA, and the US Fish and Wildlife Service (FWS) developed and implemented a Programmatic Biological Opinion (Opinion) that evaluates potential impacts of stream-crossing projects on all federally listed Threatened and Endangered species in South Dakota. The Opinion specifically addresses adverse impacts to the Topeka Shiner (*Notropis topeka)* and the American Burying Beetle (*Nicrophorus americanus),* identifying nondiscretionary 'Reasonable and Prudent Measures' (RPMs) and their implementing Terms and Conditions (TCs) that, if followed, ensure the Incidental Take Statement issued with the Opinion remains valid and that any take resulting from stream-crossing projects is exempt under section 7(o)(2) of the Endangered Species Act. The RPMs and TCs relative to the Topeka Shiner are intended to minimize take primarily by preventing decreases in Topeka Shiner population and their occupied range in South Dakota.

Monitoring and reporting is required in the Opinion to ensure the RPMs and TCs for the Topeka shiner are appropriate and effective, and the level of take exempt by the Opinion is not exceeded. Development of a monitoring program is required under RPM 4 of the Opinion. The purpose of this monitoring program is to verify that SDDOT structures, as designed, constructed, and maintained are not influencing stream geomorphology or prohibiting fish movement.

The monitoring, to include field work and observations, will be done by SDDOT Environmental staff scientists and biologists, consultants, or temporary employees. Consultants and temporary employees will be trained by qualified SDDOT Environmental staff to ensure consistency in the assessments.

Fish Passage and Stream Crossing Design:

During project scoping, the Project Identification Coordinators (PICs) in cooperation with the Environmental Staff will identify structures where fish passage is required based on the Opinion. These structures are located in the eastern part of South Dakota where Topeka Shiners occur. Anomalous structures may also be included if it is determined that the structures may affect Topeka shiners. Anomalous structures may include features such as rock check dams to aid in fish passage or fish ladders when unusual methodology is determined necessary for fish passage. The USFWS will be notified if there are structures outside the main scope of this protocol.

TCs within the Opinion require that stream crossings be designed in a manner that facilitates development of normal channel features within the crossing. The SDDOT hydraulic design procedures have been established to meet or exceed the TCs of the BO. These procedures and definitions are documented in the South Dakota Drainage Manual hyperlinked at: http://sddot.com/business/design/forms/drainage/Default.aspx. Chapter 10 and sections 10.3.4.6 titled "Fish Passage" and Appendix 10.A titled "Fish Passage Guidelines" include additional design parameters used for fish passage.

The hydraulic design procedures for fish passage reference FHWA's Aquatic Organism Passage Design Guidelines for Roadway Culverts, Hydraulic Engineering Circular No.

26 (HEC 26). SDDOT design procedures and the USACE 404 nationwide permit further require culverts be sunk below the stream flow line to allow development of natural channel features within the culvert and to prevent outlet perching that may lead to restricted fish movement.

Specifically, the natural channel forming process is to be maintained by sizing stream crossings according to bankfull (Q_2) channel size, streambed slope, and channel complexity. The floor elevation of culverts is to be set below flow line of the stream as appropriate to facilitate the development of normal channel features within the culvert. At a minimum the culvert floor elevation will be set 1 foot below the stream flow line but not less than the adjustment profile line. Depth of counter sinking will be determined through design analysis tools and programs as discussed in the hydraulics design procedures. The culvert width will be at least 1.2 times the Q_2 channel width unless special circumstances dictate otherwise and shall be estimated using project survey data and peak flow estimation models or other models as appropriate. Finally, any installed diversion channels must be at grade with the stream bed with no fish passage obstructions.

The bankfull channel can generally be defined as the Q2 stream channel or the elevation at which stream flow spills into the floodplain, whichever is less. In most cases, culverts will be sized much greater than the bankfull channel based solely on hydraulic criteria. In some rare cases, culverts may constrict the bankfull channel, especially if the culvert is designed for a very low flood recurrence frequency or the culvert is being placed in a watershed with a very large drainage area (i.e., > 100 sq mi). In some special cases, an exemption to the minimum culvert width may be allowed if strong evidence is available to suggest that fish passage will not be adversely impacted due to the width of the culvert. The USFWS will be notified if there are structures outside the main scope of this protocol and these projects will be processed through individual formal consultation. While exemptions do not fall under the terms and conditions of the BO, these structures will be monitored under this monitoring plan.

Site Inspections:

Monitoring in the late summer or fall will take place to adequately assess channel and streambed conditions resulting from past seasonal flows. Low flows of late summer and fall provide the best opportunity to access the site, evaluate channel and streambed conditions, take photos, and assess how the structure is functioning with regards to fish passage during low flows. Monitoring will be completed after the first high flow season following project completion and in the third and fifth year after construction[1]. For example, a structure built in the summer of 2012 will be assessed in the fall of 2013, 2015 and finally 2017. In order to limit stream degradation and harm to fish during these assessments, stream disturbance will be limited to the greatest extent practicable.

The SDDOT will make a reasonable effort to perform surveys for each structure appended to the 2008 B.O. in accordance with this monitoring protocol however; the FWS recognizes there may be conditions and limitations that may preclude completion of surveys at each site. It is also noted that structures built between 2009 and 2011 have not been reviewed to date (pending an approved monitoring protocol). These

[1] Opinion, p.46 RPMs/TCs B-1, Monitoring will be conducted on an annual or biennial basis

structures will be given initial priority and the first assessment observations of these structures will be compared to the original design drawings and NBI photos (if available). The inspection and findings documentation will be recorded on the 'SDDOT Fish Passage Assessment' form (See Attachment A).

The 'SDDOT Fish Passage Assessment' form includes the following:

General Project Information: This information will include specific project information, year constructed, county, structure location, stream name, date of assessment, and name of person completing the assessment.

- **Structure Type**: The structure type and size will be documented.

- **Structure Shape Comment:** The structure shape will be recorded using descriptions defined in the data sheet. The intent of recording structure shapes is to document whether the stream transition to and from the structure maintains and promotes fish passage. Terms used to describe the applicable outlet configuration are as follows:

  Inlet Type

  Projecting: The barrel simply extends beyond the embankment. No additional support is used.

  Wing wall: A wing wall is a retaining wall placed adjacent to a culvert to retain fill and to a lesser extent direct water.

  Head wall: Used along with wing walls to retain the fill, resist scour and improve the hydraulic capacity of the culvert

  Apron: Aprons are usually made of concrete or riprap and installed to prevent or reduce scour. If an apron exists, a brief description will be provided in the observation section, including any low flow concentration structures.

  Other: Could be Energy dissipaters, Bridge, etc...

  Outlet Type

  At Stream Grade: No perched condition at the outlet exists

  Cascade over Riprap: Culvert flows onto either a rough riprap surface causing turbulence or a riprap / bedrock surface where flow depth decreases as it exits the culvert. If this condition exists, observation will be made to document whether or not this condition may prevent fish passage.

  Free fall into Pool: Culvert outlet is perched directly over a pool, requires migrating fish to jump into culvert from outlet pool. If this condition exists, observation will be made to document whether or not this condition may prevent fish passage.

Free fall onto riprap: Culvert outlet is perched and exiting water plunges onto riprap or bedrock with no pool. If this condition exists, observation will be made to document whether or not this condition may prevent fish passage.
Outlet apron: Aprons are usually made of concrete or riprap and installed to prevent or reduce scour. If an apron exists, provide a brief description in the observation section, including any low flow concentration structures.

- **Observations:**
    1. *The structure is installed generally in accordance with plans (width, depth, location, size, countersunk, etc…).* This question will be answered during the first assessment only.
    2. *Overall structure width is wider than the average stream width upstream and downstream.* This measurement will be compared to background information from the hydraulic data and cross sections developed and used during design. If the background information does not exist, the stream width will be determined during the 1st assessment by taking an average of 3 measurements upstream and 3 measurements downstream.
    3. *Natural streambed material exists throughout structure (i.e. structure remains counter sunk approximately 1 foot).*
    4. *Stream channel is free of scour activity that may impede fish passage.*
    5. *A natural low flow channel exists through the structure or <u>if not</u> the streambed surface within the structure simulate the streambed beyond the structure inlet and outlet similar to design conditions.*
    6. *Steam is free of channelizing along the surface of the structure.* Presence of a Thalweg allows the stream to flow in a narrower defined low flow channel within the stream which is suitable for fish passage and not along the surface of the structure. If a Thalweg is not present, a wider shallower stream may impede fish movement due to limited depths, elevated water temperatures, and/or other conditions that are not ideal for fish passage.
    7. *Up & downstream channel appears stable (no apparent erosion).*
    8. *Vegetation is/has re-established on the stream banks within the construction area.*

- **Stream Cross-Sections:** To evaluate whether the SDDOT structures are performing as intended, stream cross-sections will be taken perpendicular to the stream at the following locations:

  3 cross sections will be taken at the following locations to determine if a Thalweg exists within the structure (see Figure 1): 1) within 10 feet of the structure inlet, 2) within 10 feet of the structure outlet, and 3) inside the structure (if accessible). Visual observations will be used instead of the 3rd cross section if this location is not be accessible (i.e. structure is too small to access with survey equipment, soil conditions are not stable, water volumes are excessive).

  If a Thalweg does not exist within the structure (the area is flat or there is only a slight depression with no true defined low flow channel), a 4th cross section will be taken downstream of the structure at a distance of approximately 7 times the width of the stream (refer to Figure 2) to determine whether the structure appears to be changing the stream profile.

If a Thalweg does not exist within the structure or downstream of the structure, a 5th cross section will be taken upstream of the structure at approximately 7 times the width of the stream (refer to Figure 3) to determine whether the structure appears to be changing the stream profile.
Analysis of cross sections taken will be used as follows and findings will be documented in the report as shown below:

1. If a Thalweg exists within the structure (cross sections 1, 2, and 3), no additional cross-sections will be taken and the assessment will document the structure is performing as intended. Else…
2. If a Thalweg does not exist within the structure (cross sections 1, 2, and 3) and does not exist downstream (cross section 4), no additional cross-sections will be taken. The assessment will document "no further conclusion can be made at this time as fish restriction (if occurring) is below the structure". Else…
3. If a Thalweg does not exist upstream, exists downstream but does not exist within the structure the report will document "the structure is no more of a barrier than the stream upstream and no further conclusion can be made at this time".
4. If a Thalweg exists upstream and downstream of the structure but does not exist within the structure a detailed survey and correction plan will be required.

- **Stream Velocity:** A natural earthen and/or granular stream bank edge is a good indicator the stream is acting independent of the structure. If the edge of the stream is in contact with the structure during Q_2 or lower conditions, material within the structure may have shifted or water velocities, turbulence, and friction along the structure walls may have an effect on fish movement.

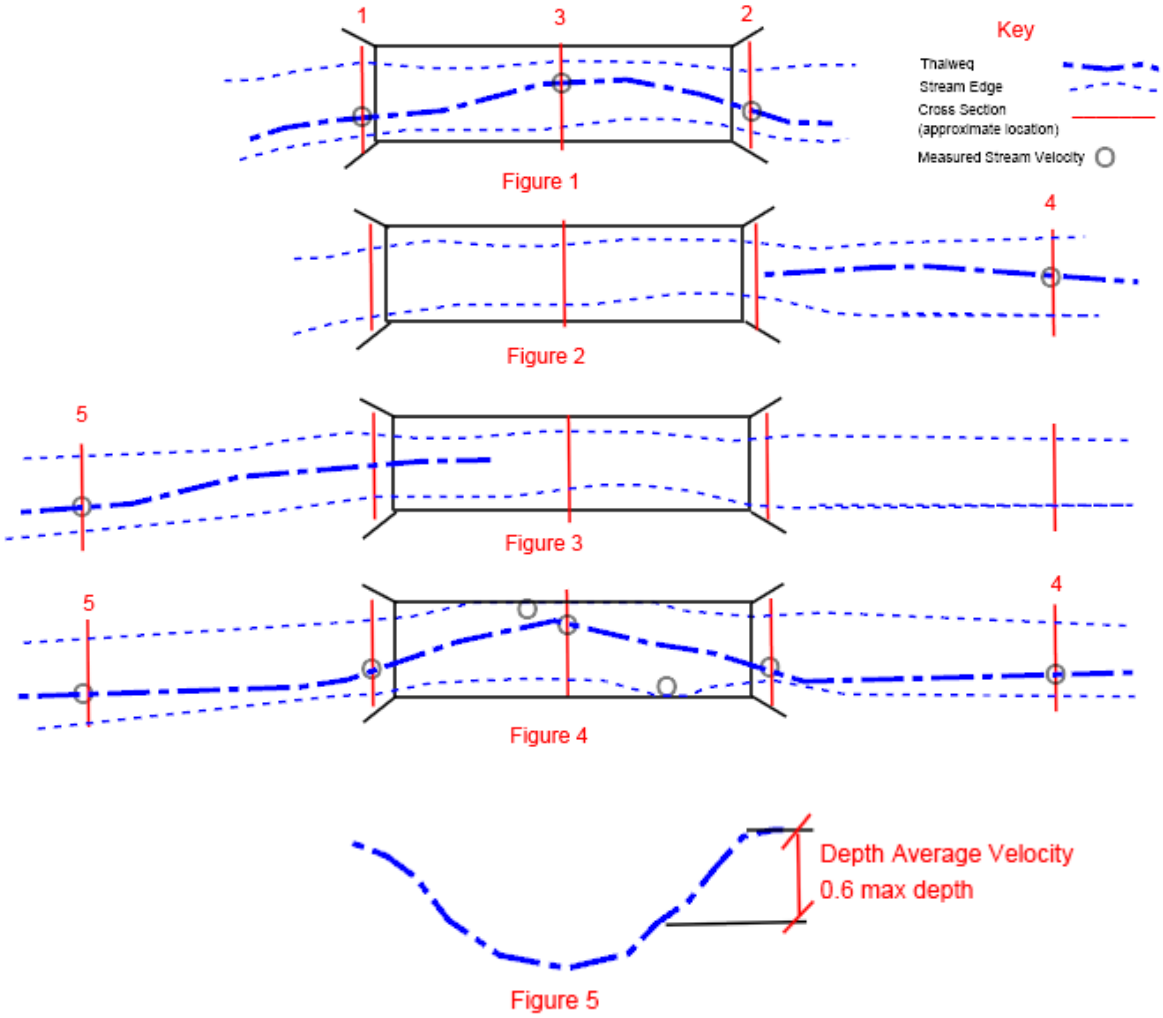
  If the stream is in contact with one or both sides of the structure during the time of the assessment, the stream bed depth and reveal along the edges shall be evaluated to determine how the velocities compares to the natural stream edge outside the structure. The depth average velocity measured at a depth of 0.6 times the depth of the stream at the thalweg (see Figure 5) will be recorded and compared to the depth average velocity a distance approximately 7 times the width of the stream upstream and downstream of the structure within the Thalweg (see Figures 4) if a Thalweg exists.

  Analysis of stream velocities taken will be used as follows and documented in the report findings.

  1. If the stream is dry or water velocities are beyond the equipment's specified accuracy limits (i.e. <0.5 ft/s for March McBirney) at the locations where velocities are to be taken, the condition will be noted and no velocities will be taken. Else…
  2. If the depth average velocities within the structure are at or below those recorded upstream and downstream, the assessment will document the structure is not considered to be impeding fish passage. Else…
  3. If the depth average velocities within the structure are higher than those recorded upstream and downstream the structure and exceed the sustained swimming capabilities of Topeka shiner (0.9 ft./s -1.31ft./s. with burst swimming observed in water velocities of 1.31ft./s-2.46 ft./s (Adams 2000)[2]), the structure may be

[2] S. Reid Adams, Jan Jeffrey Hoover and K. Jack Kilgore 2000. Swimming Performance of the Topeka Shiner (Notropis topeka) an Endangered Midwestern Minnow. *American Midland Naturalist* Vol. 144, No. 1 pp. 178-186 Published by the University of Notre Dame

influencing the stream. A more detailed survey may be required. Further assessment and the need for a correction plan will be discussed with the FWS.



- **Comments**: Unique observations that have or may impact stream morphology or fish passage in the future such as widening of the channel, forming/changing pool locations/sizes, bank erosion, new deposits, isolated unusual channelization within the streambed, etc... will be noted. Changes to channel widths on structures designed narrower than the stream channel that were processed by Formal Consultation will be discussed.

- **Photographs:** A minimum of 2 photographs will be taken in the direction of the structure inlet and 2 in the direction of the structure outlet within a distance of 7 times the width of the structure. Photograph locations will be documented and recorded (i.e. GPS latitude and longitude coordinates) such that photographs taken during subsequent inspections will be from the same location and direction. The intent of these photographs is to document whether 1) the stream channel width, location, and/or depth is changing over time and 2) whether changes in the channel may

obstruct fish passage at the site. It is most important to select locations that capture the intended need for the photograph therefore locations shall be selected both upstream and downstream that are representative of: undisturbed channel beyond the construction area, disturbed channel, and the structure.

Assessment, Notifications, Corrective Actions:

Upon completion of the site inspection and assessment, each report will be filed with the project records and in an electronic Fish Passage file folder.

If it is determined a structure is not passable to fish, a report will be submitted to the FWS and FHWA within two weeks and a corrective action plan will be developed in coordination with FWS and FHWA. Where fish passage has been obstructed by debris or some other condition not related to the design or construction, the SDDOT Environmental Staff will coordinate with Operations to have the obstruction removed within three months of the inspection. Depending upon seasonal conditions, this timeframe may need to be extended. If necessary, extensions will be coordinated with FWS. Obstructions identified and corrected by the Area Offices, through normal roadway maintenance inspections, will be reported to the Environmental Office for further review and corrective actions if needed. Documentation of corrective actions will be made available to FWS within two weeks of completion. Any corrective actions taken will be documented in the annual report and a corrective action database will be maintained by the Environmental Office.

Annual Reporting:

Per RPM#6 in the Opinion, a hard copy of the annual report will be provided to the FWS by March 1 of each year that reviews activities conducted under the Opinion. In an effort to disseminate monitoring findings in a timely manner, monitoring reports will be completed, included, and disseminated with the Annual Report. These reports will also be available by request as well as online to the FWS, FHWA and any other interested entities at the SDDOT website:
http://www.sddot.com/transportation/highways/environmental/endangered/Default.aspx

Within 1 month of distribution of the annual report (or other agreed time agreed to by all parties), the FWS, FHWA and SDDOT will meet to review report findings. If no corrective actions have been required within the first 5 years of monitoring, the need for further monitoring by site will be determined at this meeting. If systemic issues are identified, a corrective action plan will be developed and the group will determine whether any specific sites will be monitored beyond 5 years. During the annual meeting the group will also evaluate effectiveness of the data being collected on the 'SDDOT Fish Passage Assessment Work Sheet'. Revisions will be discussed and implemented as needed to meet the terms and conditions of the BO.

Appendix II: Individual *Fish Passage Assessment Work Sheets* with photographs for structures monitored in 2018 that impacted the Topeka shiner

Fish Passage Assessment Work Sheets and associated photographs for individual monitored structures are placed in an attachment folder. *Fish Passage Assessment Work Sheets* and associated photographs for individual monitored structures are provided to USFWS and FHWA on compact discs.