United States Department of the Interior

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In Reply Refer To:
01EOFW00-2017-F-0528-R001
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JUL 26 2019

Memorandum

To: Deputy Area Manager, Bureau of Reclamation
Columbia-Cascades Area Office
Yakima, Washington

From: Field Supervisor, Bend Field Office
Bend, Oregon

Subject: Reinitiation of Formal Consultation on Bureau of Reclamation Approval of Contract Changes to the 1938 Inter-District Agreement for the Operation of Crane Prairie and Wickiup Dams, and Implementation of the Review of Operations and Maintenance (ROM) and Safety Evaluation of Existing Dams (SEED) Programs at Crane Prairie and Wickiup Dams, Deschutes Project, Oregon (2017-2019)

This memorandum responds to your June 17, 2019 request for reinitiation of formal consultation on the subject actions. Please attach it to the U.S. Fish and Wildlife Service (Service) September 29, 2017 Biological Opinion (Service reference no. 01EOFW00-2017-F-0528) addressing the same actions. Collectively, these documents represent your new Biological Opinion (Opinion) on the effects of the subject actions on the threatened Oregon spotted frog (*Rana pretiosa*) and its critical habitat (CH). Please note that the Incidental Take Statement (ITS) accompanying the 2017 Opinion has also been revised and is included in this memorandum. The revised Opinion and ITS were prepared in accordance with the requirements of section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq.). Your request for reinitiation of formal consultation was received on June 17, 2019.

This Opinion is based on information provided in the Bureau of Reclamation's (Reclamation) Biological Assessment (BA), dated June 17, 2019, the Service's 2017 Opinion referenced above (and herein incorporated by reference), and other sources of information cited below. A complete decision record of this consultation is on file at the Service's Bend Field Office.

Consultation History

- During May of 2019, the Service reviewed drafts of Reclamation's supplemental BA on the subject actions dated May 3, 2019, and May 17, 2019.
- On June 6, 2019, the Service and Reclamation convened a call to discuss the previously unanalyzed effects of large drops in river water volume during spring of 2019 water management activities.
- On June 7, 2019, the Service received a draft effects analysis using the updated RiverWare model from Reclamation and updates to the supplemental BA. Upon review, the Service requested the updated RiverWare hydrographs for the action.
- On June 14, 2019, the Service received the updated RiverWare hydrographs from Reclamation.
- On June 17, 2019, Reclamation submitted a request to the Service for reinitiation of formal consultation on the subject actions. The Service received Reclamation's request for reinitiation that same day.
- In June 25, 2019, Tumalo Irrigation District (TID) manager, Ken Rieck, informed the Service of a need to conduct maintenance work on Crescent Dam. The Service requested information regarding the maintenance activities and timing in order to assess as an interrelated action with continuance of the proposed action.
- On July 16, 2019, the Service received a description of the anticipated maintenance work at Crescent Dam from Marty Vaughn, consultant for TID.

DESCRIPTION OF THE PROPOSED ACTION

Duration

The majority of the project description presented in the Service's 2017 Opinion remains unchanged. In its June 17, 2019, request for reinitiation, Reclamation extended the term of the action to December 31, 2020, to provide sufficient time to complete the Habitat Conservation Planning process for the spotted frog in the Deschutes River Basin.

Winter Flows below Wickiup

Reclamation, in its supplemental BA, stated that they would continue to use its authorities to "maintain a minimum flow of 100 cfs below Wickiup Dam during the winter, but will increase winter flows below Wickiup up to as much as 200 cfs as long as natural inflows are sufficient to fill Wickiup Reservoir prior to the next irrigation season" (Reclamation 2019, p. 2). Because the release of flows between 100 cfs and 200 cfs are conditional, this aspect of the proposed action has not significantly changed from what was presented in the 2017 Opinion.

Planned Maintenance and Inspection Activities

Reclamation's supplemental BA, also described specific planned maintenance and inspection actions that would occur during the extended term of the proposed action. These actions are part of the Review of Operations and Maintenance (ROM) and Safety Evaluation of Existing Dams (SEED) programs previously described in the 2017 Opinion. However, some of the planned maintenance and inspection actions described for 2019 and 2020 have an increased duration compared the actions previously analyzed in the 2017 Opinion. Tables 1-3 (adapted from Reclamation 2019) describe the revised proposed ROM and SEED actions.

Table 1. Proposed Crane Prairie Dam inspection and operational testing activities scheduled for 2019 and 2020.

Activity	Details	Operational Requirements	Proposed Event
Dive Inspection of Stilling Basin	Requires no-to-low flows for visibility and safety. Can be completed in less than 2 hours.	3 hrs at 0 cfs	October 2019
Dive Inspection of Intake Tower	Reclamation safety guidelines do not allow divers near an intake structure at flows >2 cfs. Velocities inside the trash screen and in front of the gate must be below this criteria.	3 hrs at 0 cfs	October 2019
Concrete Conduit Inspection	Conduit inspections require turning off flows and pumping upstream of the stilling basin flow spreading crest. Inspections are past due. The preferred method is to perform one side at a time by placing stoplogs in front of the conduits and pumping water out. Requires low flow conditions.	6 hrs at 25 cfs	Aug-Oct 2019
Gate Full-Open Full-Close Test	Required by SOP. Test creates flow adjustments of 500 cfs for a few minutes downstream. An alternate test is attempted with the bulkhead in place to avoid these flow changes.	A few minutes up to 500 cfs	August 2019

Table 2. Proposed Crane Prairie Dam maintenance activities scheduled for 2019 and 2020.

Activity	Details	Operational Requirements	Proposed Event
Recommendation 2015-2-C	Remove rock debris from the downstream end of the outlet works in the stilling basin. This requires divers to remove rocks.	3 hrs at 0 cfs	October 2019 or 2020
Recommendation 2015-2-F	2015-2-F Perform a closed-circuit television (CCTV) examination of the entire toe drain system as necessary to observe and record the condition of the toe drain and to determine if there is a T-intersection along the alignment of the left toe drain pipe. This requires shutting down flows and draining the stilling basin.	6 hrs at 0 cfs	October 2019 or 2020

Table 3. Proposed Wickiup Dam maintenance activities scheduled in 2019 and 2020.

Activity	Details	Operational Requirements	Proposed Event
Recommendation 2013-2-B	Patch cracked concrete areas of exposed reinforcing steel on the outlet works stilling basin splitter sall. Worst case scenario requires total dewatering of the stilling basin and use of cofferdam to complete repairs. If stilling basin repairs are needed, this process (dewatering, prep, concrete replacement, etc.) could take >2 weeks to complete assuming no problems and cooperative weather.	3 weeks, minimal toe drain flow plus bypass pipe, 10 cfs	Oct-Nov 2019 or 2020
Recommendation 2013-2-B	Patch exposed concrete aggregate on valve house window and bridge over outlet works stilling basin. Water will have to calm so concrete is dry. 10 cfs from bypass pipe would supplement flow to river. Should be completed concurrently with 2013-2-B.	3 days at 10 cfs - this would occur within the 3 week window identified above.	Oct-Nov 2019 or 2020

ENVIRONMENTAL BASELINE FOR THE SPOTTED FROG AND ITS CH

The 2017 Opinion provided a detailed description of the environmental baseline for the spotted frog and its CH (Service 2017, pp. 34-132). That description of the condition of the species and the CH in the action area remains accurate and is incorporated herein by reference. Below, we are providing a summary of new information that we have gathered and received since the 2017 Opinion.

Egg Mass Counts

Spotted frog breeding surveys were conducted in the action area in 2018 and 2019. Table 4 provides a summary of egg mass counts (i.e., estimate of reproductive female frogs) in the action area in 2018 and 2019.

Table 4. 2018 and 2019 egg mass counts at spotted frog breeding sites in the action area.

Breeding Site/Population	**2018**	**2019**
[Upper Deschutes]		
Crane Prairie	770	915
Gold Fish Pond	23	49
Deschutes River- Wickiup Arm	5	7
Dead Slough	55	89
Benchleg Pond	18	14
La Pine State Park	7	2
Island Loop	4	15
Sunriver	764	680
SW Slough Camp	20	12
East Slough Camp	58	93
Old Mill Pond & LSA Marsh	3	14
[Little Deschutes]	**2018**	**2019**
Crescent Creek above Highway 58	23	12
Crescent Creek below Highway 58	7	12
Crescent Creek BLM Oxbows	23	10
South Masten Road	2	2
Leona Park	10	Not surveyed
Oxbows (La Pine High School)	12	Not surveyed
Rosland Park	3	Not surveyed
Riverside Oxbow (RM 21)	17	3
Casey Tract	19	7
Crosswater	38	17

Monitoring Reports

Reclamation has submitted two monitoring reports to the Service pursuant to the terms and conditions of the ITS accompanying the 2017 Opinion for calendar years 2017 and 2018 monitoring activities. A key finding presented in those reports and associated hydrological studies is the determination that the Wickiup Arm spotted frog breeding site is mostly influenced by storage volume in Wickiup Reservoir (Vaughn 2018). Vaughn (2018) found that the Wickiup Arm breeding site was no longer inundated when reservoir volumes dropped below 142,000 acre feet. Despite Wickiup storage being between 134,000 and 135,000 acre feet and the known breeding site being void of water, spotted frogs deposited egg masses (Table 4) in an area near to the known breeding site within suitable habitat adjacent to the Deschutes River.

Recovery Actions

Since the 2017 Opinion was issued, several recovery actions have been implemented for the spotted frog along the Deschutes River downstream of Wickiup Dam. The U.S. Forest Service and their partners completed the restoration of a historic spotted frog site at Ryan Ranch in Reach 4 of the Deschutes River in the spring of 2019. This site is currently unoccupied by spotted frogs but we expect it to be naturally recolonized in the near future.

In Sunriver, bull frog eradication efforts have been conducted over the last three years (Campbell 2019, pers. comm). Bull frog control actions are likely to positively contribute to the trend and stability of the Sunriver breeding population of the spotted frog.

Completed Research

Pearl and others (2018) completed a study of late-season movement and habitat use by spotted frogs. Spotted frogs used a range of habitat types for overwintering, including distinctive features such as springs and beaver channels. Reclamation (2019, p. 9) pointed out that Pearl found frogs downstream of Wickiup predominantly using semi-terrestrial habitats for overwintering (Pearl et al. 2018, p. 544). However, neither Reclamation nor Pearl reported on whether the frogs tracked to these semi-terrestrial locations survived the winter or if they would have chosen aquatic locations for overwintering if winter flows in the Deschutes River were unregulated. This new information will inform our analysis on the effects of planned maintenance and inspection actions presented later in this Opinion.

As per Term and Condition 9 in the ITS accompanying the 2017 Opinion (pp. 213-214), Reclamation funded USGS to conduct a telemetry study of spotted frogs at Crane Prairie Reservoir. The purpose of the study was to determine fall movement and habitat utilization prior to overwintering. The telemetry work was conducted from September to December 2018, and approximately 32 spotted frogs were tracked over this time period. Preliminary data show that spotted frogs do not move far from the regularly used spring oviposition sites and that they are using both the reservoir and tributaries to the reservoir for overwintering. A manuscript for the telemetry study at Crane Prairie Reservoir is anticipated in early 2020.

Additional Effects of the Action on the Spotted Frog and its CH since September of 2017

Upper Deschutes

The 2017 Opinion described the adverse effects to spotted frogs that occur when flows in Deschutes River reaches 1 and 2 are below 900 cfs (e.g., pp. 64, 143, 145). We specifically addressed the reduced number of days in May that flows would be at less than 900 cfs as predicted by the RiverWare model (Service 2017, p. 150). However, we did not fully analyze the sudden and significant drops in flow that can occur at the WICO gauge in May when agricultural demand is reduced due to rainfall events in the 2017 Opinion.

The 2017 Opinion described predicted drops (reductions in flows) in the proposed spring hydrograph at the WICO gauge based on outputs of the RiverWare model (pp. 147). However, the effects to spotted frogs resulting from these flow reductions in May and June of 2019 below 900 cfs after previously reaching much higher volumes were not adequately discussed in the 2017 Opinion. Flows at the WICO gauge increased to 1,200 cfs by May 14, 2019, allowing tadpoles in Deschutes River reaches 1 and 2 to seek shelter in the now inundated riparian vegetation (Figure 1). Subsequently, agricultural demand was sharply decreased due to precipitation and flows at the WICO gauge dropped to 693 cfs by May 24, 2019. This action likely led to the death of tadpoles by stranding them in the vegetation where they were then desiccated or predated. These adverse effects to an entire generation of spotted frogs at breeding sites in Deschutes River reaches 1 and 2 are likely to have adverse population-level consequences.

The ITS in the 2017 Opinion allowed for flows below 900 CFS between September 15 and May 31 and the Service defined "conditions that reflect take exceedance" for reaches 1 and 2 as "flows at WICO gauge <900 cfs between June 30 and September 14" (p. 210). Therefore, the month of June was not specifically accounted for in the ITS in the 2017 Opinion. Data obtained from Hydromet show that flows at the WICO gauge were below 900 cfs during 0 days in June of 2018, and during 2 days in June of 2019. Although flows in June are rarely less than 900 cfs at WICO, we anticipate that spotted frogs of all life stages may be at risk of predation when flows are less than 900 cfs in June over the duration of the proposed action. Spotted frogs of all life stages may also be impacted by sudden and significant drops in WICO after flows are above 900 cfs in May and June, as described above. This Opinion addresses the need to lessen the impact to spotted frogs in the spring below.

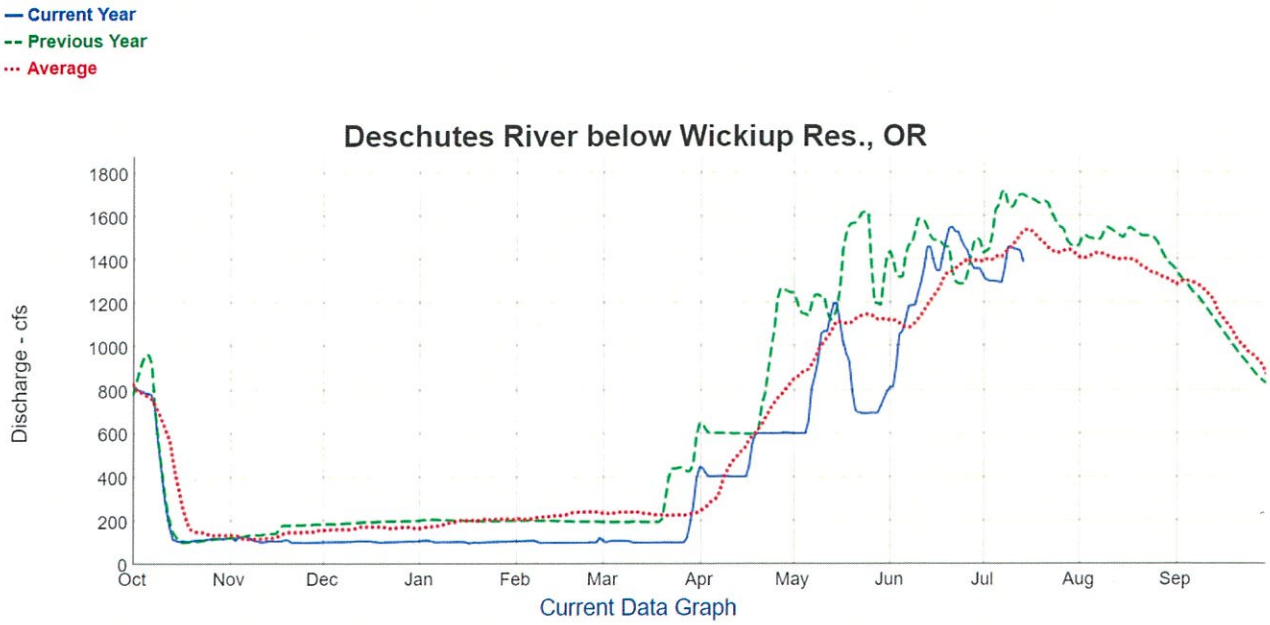

Figure 1. Flows at the WICO gauge obtained from Hydromet on July 17, 2019.

Little Deschutes

The 2017 Opinion includes a discussion and finding that natural Crescent Creek flows in the spring can be high and cause stranding (Service 2017, pp. 115) when spotted frogs deposit egg masses in shallow areas in April that are devoid of water by late May when natural hydrological inputs decrease. In April 2019, spotted frog breeding sites were deeply inundated on Crescent Creek due to natural precipitation in addition to 30 cfs being released from Crescent Lake. By May, water had receded from wetland breeding sites as natural inflows decreased. The Service documented the stranding of tadpoles on the lower Crescent Creek BLM site on May 30, 2019. Although it is difficult to differentiate between natural and regulated hydrological inputs to Crescent Creek, the Service finds, based on 2019 flow conditions, that spring flow releases of 30 cfs from Crescent Dam are likely to exacerbate flooding and increase the severity of egg mass and tadpole stranding. The Service did not describe releases from Crescent Dam during spring flooding as an adverse effect likely to cause stranding of spotted frog eggs and tadpoles in the 2017 Opinion. Adaptive management of spring flows from Crescent Dam in the context of natural hydrological conditions will be necessary to lessen the potential for stranding of spotted frog egg masses and tadpoles.

Summary of the Current Environmental Baseline

In the 2017 Opinion, the Service concluded that "over the entire action area within the Upper Deschutes River Sub-basin, spotted frog habitat has been significantly altered and continues to be influenced by the operation of Crane Prairie and Wickiup reservoirs" (p. 40). "The action area encompasses a large portion of the range of the Oregon spotted frog and contains a significant portion of the known population and a significant portion of remaining habitat for this species" (p. 121). Similarly, we concluded in the 2017 Opinion that CH in the action area is "has

been significantly altered (i.e., degraded) due to past and ongoing water management associated with the Deschutes Project and other threats," and "improving the conservation function of critical habitat ... is essential to meeting the recovery needs of the Oregon spotted frog" (Service 2017, p. 130). The Service reaffirms these findings after review of the newly available data since September of 2017.

EFFECTS OF THE ACTION ON THE SPOTTED FROG

Duration

In the 2017 Opinion, we anticipated adverse effects to spotted frogs nearly year-round for the original 2-year term of the proposed action (Service 2017, pp. 194-204). With implementation of the revised proposed action, the effects to spotted frogs described in the 2017 Opinion are likely to continue to occur in the action area for up to an additional 17 months.

RiverWare Model-Predicted Effects of the Proposed Action

The 2017 Opinion relied on the RiverWare model to estimate the extent and severity of adverse effects on the spotted frog across varying types of water years (Service 2017, pp. 133-135). Specifically, Reclamation and the Service estimated the number of days when threshold flows would not be met during certain critical periods for spotted frogs. Reclamation described in their supplemental BA that the RiverWare model had been updated (Reclamation 2019, Appendix A). The Service assessed the revised model and outputs to inform the extent and severity of effects to spotted frogs that we anticipate for the remaining 17 months of the proposed action. Based on RiverWare-modeled flows, we now anticipate a longer duration of adverse effects to spotted frogs in some seasons to be caused by the proposed action than previously anticipated (Table 5). Specifically, we now expect fewer days at higher flows in Deschutes River reaches 1, 2, and 3 during the spotted frog breeding season and the tadpole rearing season. In the Crescent Creek system, the new RiverWare modeled flows appear higher during the rearing period, which can improve rearing habitat conditions for spotted frogs during summer. However, as stated in the 2017 Opinion (Service 2017, pp. 133), we lack baseline hydrological information to determine an effect to spotted frogs using the RiverWare model and gauge data for Crescent Creek. Similarly, a change in anticipated duration of particular flows in the Little Deschutes River also have little relevance, since we do not have specific flow thresholds to determine effects to spotted frogs (Service 2017, pp. 133). The lack of gauges in the Crescent Creek and Little Deschutes River system render the RiverWare less useful for determining effects to spotted frogs. Continued on the ground monitoring and adaptive management are necessary in Crescent Creek and the Little Deschutes River.

Table 5 shows RiverWare modeled estimates of the number of days that flow thresholds will be exceeded during spotted frog life stages at 4 stream gauges in the 2017 RiverWare model versus the current RiverWare model. The median days exceeding thresholds during the spotted frog pre-overwintering period at the WICO gauge, during the spotted frog tadpole rearing and pre-overwintering period at the BENO gauge, and spotted frog breeding and pre-overwintering at the LAPO gauge were not included in this table because those estimates did not significantly change

from what was presented in the 2017 Opinion. Shaded cells indicate significant departures from the previous RiverWare output considered in the 2017 Opinion.

Table 5: Number of days above flow thresholds during spotted frog life cycle stages using RiverWare modeled outputs in 2017 versus 2019.

Gauge (Time Period/Spotted Frog Life Cycle Stage)	Flow Threshold (cfs)	Median Days Exceeding Flow Threshold	
		2017 Analysis	2019 RiverWare Run
WICO (March 15 – April 30; OSF Breeding)	600	28	30
	700	13	9
	800	12	7
WICO (April 1 – August 1; OSF tadpole rearing)	600	123	123
	700	91	88
	800	82	80
	900	71	63
	1,000	62	50
	1,100	56	44
	1,200	47	31
	1,300	37	21
	1,400	26	6
	1,500	13	0
BENO (March 15 – April 30; OSF Breeding)	1,100	30	31
	1,200	29	30
	1,400	19	14
	1,600	15	4
	1,800	12	0
CREO (March 15 – April 30; OSF Breeding)	20	47	47
	30	45	47
	40	15	10
	50	13	4
CREO (April 1 – August 1; OSF tadpole rearing)	30	123	123
	40	97	64
	50	93	54
	60	82	46
	70	28	39
	80	25	32
	90	20	31
CREO (Sept. 1 – Oct. 15; OSF pre-overwintering)	30	45	45
	40	45	30
	50	45	29
	60	45	28
	70	1	28
	80	1	23
	100	1	5
LAPO (April 1 – August 1; OSF tadpole rearing)	200	92	62
	300	70	47
	400	48	34

Planned Maintenance and Inspection Activities

The Service also anticipates that changes to the proposed action with respect to planned inspection and maintenance activities are likely to cause adverse effects to the spotted frog that were not specifically described in the 2017 Opinion. Specifically, the originally proposed inspection and maintenance activities required low flows (25-40 cfs) for up to a week below Wickiup Dam. Reclamation is now proposing to hold low flows (10 cfs plus bypass pipe) for up to 3 weeks to accomplish maintenance activities at Wickiup Dam. Inspection and maintenance actions at Crane Prairie Dam remain very similar to those actions originally proposed.

The 2017 Opinion (pp. 180-182) concluded that temporary low flows for up to 6 hours between Crane Prairie Dam and Wickiup Reservoir and temporary low flows for up to 1 week from Wickiup Dam to the Colorado Street Bridge would increase the risk of "displacement, predation, or exposure to the elements" for juvenile, subadult, and adult spotted frogs "seeking or already occupying overwintering habitat." Those effects represent a significant impairment of essential behaviors that is reasonably certain to result in the death of an unknown number of spotted frogs associated with occupied spotted frog habitats in the action area (Service 2017, pp. 200, 209-210).

New information (Pearl 2018) suggests that fewer frogs than anticipated in the 2017 Opinion may be exposed to the temporary low flows because some frogs use semi-terrestrial overwintering locations along the Deschutes River. Additionally, gauge data provided by Reclamation (Reclamation 2019, pp. 15) show that effects of temporary low flows likely do not extend much farther than Benham Falls (BENO Gauge), instead of all the way to the Colorado Street Bridge as previously anticipated (Service 2017, p. 182). However, the low flows for inspection and maintenance are now proposed to be two weeks longer below Wickiup Dam and low flows will be 10 cfs rather than 25-40 cfs. Based on consideration of this information and our previous analysis presented in the 2017 Opinion, we find that the updated planned inspection and maintenance activities are still likely to cause a significant impairment of essential behaviors that is reasonably certain to result in the death of an unknown number of spotted frogs, and that the effects to exposed frog individuals in Reaches 1, 2 and 3 (Wickiup Dam to Benham Falls) are likely to be more severe than previously anticipated as a result of the increased duration of low flows.

Effects of Interrelated Actions - Planned Maintenance and Inspection Activities at Crescent Dam

The Tumalo Irrigation District is planning routine maintenance and inspection activities at Crescent Dam in the fall of 2019 that were not addressed in the 2017 Opinion. Maintenance activities involve repairing a gate, removing rocks from the ramp flume, removing rocks from the tailrace and fully opening a gate to allow for flows of approximately 40 cfs. The proposed activities will occur over a 2 to 6-hour time period in the late fall season. The short duration of the proposed maintenance work combined with timing in the fall to coincide with rain events will result in little reduction of flows within spotted frog habitat. Springs and tributaries, such as Big Marsh Creek, which are not influenced by dam operations, will continue to provide water to

spotted frog habitats as maintenance activities are conducted and the Service anticipates negligible effects to the spotted frog and its habitat from these actions.

Effects of Variability in Spring Flows in Reaches 1 and 2

As described in the updated *Environmental Baseline* section above, we now expect adverse effects to spotted frog tadpoles in Deschutes River reaches 1 and 2 during the spring as a result of large drops in discharge at the WICO gauge between April 30 and June 30 due to water management activities. These effects are likely to occur over a more extended period of time (i.e., up to an additional 17 months) based on the revised proposed action. Large drops in discharge during the spotted frog-rearing period, especially if they dip below 900 cfs, are likely to lead to the death of tadpoles by stranding them in the vegetation where they are desiccated or predated. Adverse effects to an entire generation of spotted frogs at breeding sites in reaches 1 and 2 will likely have population-level consequences. The most severely affected spotted frog breeding site, Dead Slough, is also one of the largest breeding sites (in terms of average egg masses detected) below Wickiup Dam and the only large breeding site in reaches 1 and 2. The 2019 spotted frog breeding data for Dead Slough indicate that there are at least 32 oviposition sites distributed throughout the slough. The broad distribution of egg mass oviposition sites improves resiliency within the population to the abrupt changes in gauge discharge. It is unlikely that a large drop in discharge at WICO gauge will lead to death of all spotted frog tadpoles within the population. Continued monitoring of the population is necessary to observe whether or not such an impact is measureable in the adult population two to three years post impact.

Effects of the Action on Spotted Frog Critical Habitat

Duration

In the 2017 Opinion, we anticipated adverse effects to spotted frog CH nearly year-round for the original 2-year term of the proposed action (Service 2017, pp. 182-194). Under the revised proposed action, those effects to the PCEs of spotted frog CH described in the 2017 Opinion would continue to occur in the action area for up to an additional 17 months for a total of 3 years and 4 months instead of 2 years.

RiverWare Model-Predicted Effects of the Proposed Action

As discussed in the 2017 Opinion, we relied on a RiverWare model to estimate the extent and severity of adverse effects to the spotted frog and its CH caused by the proposed action across varying types of water years (Service 2017, pp. 133-135). The revised RiverWare model and outputs were used to inform the extent and severity of effects to spotted frog CH that we anticipate for the remaining 17 months of the revised proposed action. Based on a comparison of RiverWare-modeled flows in 2017 and 2019, we now anticipate a longer duration of adverse effects each season than previously anticipated (Table 5). Specifically, we now expect fewer days at higher flows in Deschutes River reaches 1, 2, and 3 during the spotted frog breeding season and the tadpole rearing season. On that basis, we now expect a greater duration of adverse effects to spotted frog CH based on RiverWare modeled flows.

As described above, the new RiverWare modeled flows indicate that there will be more days at higher flows in Crescent Creek during the rearing period. Therefore, we anticipate improved rearing conditions within critical habitat in Crescent Creek based on the RiverWare modeling. However, as stated above, we lack information pertaining to the specific discharge-habitat relationship on Crescent Creek and the Little Deschutes River downstream of the confluence with Crescent Creek. The Crescent Creek/Little Deschutes River system is not fully equipped with hydrological gauges to measure inputs precisely which makes the development of discharge to habitat relationships difficult. Inputs of groundwater to the Crescent Creek system further complicate such an assessment. Therefore, we cannot rely on the RiverWare modeled data alone to assess whether or not continuation of the proposed action is likely to improve or degrade critical habitat. Seasonal habitat monitoring to determine spotted frog habitat inundation is necessary.

Planned Maintenance and Inspection Activities

The Service also anticipates that changes to the proposed action with respect to planned inspection and maintenance activities would result in adverse effects not specifically described in the 2017 Opinion. Specifically, the originally proposed inspection and maintenance activities required low flows (25-40 cfs) for up to a week below Wickiup Dam. Reclamation is now proposing to hold low flows (10 cfs plus bypass pipe) for up to 3 weeks to accomplish maintenance activities at Wickiup Dam. Inspection and maintenance actions at Crane Prairie Dam remain very similar to those actions as originally proposed.

The 2017 Opinion (pp. 189-192) concluded that temporary low flows of up to 6 hours between Crane Prairie Dam and Wickiup Reservoir and temporary low flows of up to 1 week from Wickiup Dam to the Colorado Street Bridge are likely to adversely affect PCEs 1, 2, and 3 of spotted frog CH in Critical Habitat Sub-Units 8a and 8b. Stated another way, we anticipate that temporary low flows would temporarily reduce the quality of overwintering habitat, movement corridors, and refugia habitat for spotted frogs between Crane Prairie Dam and the Wickiup Reservoir and between Wickiup Dam and the Colorado Street Bridge.

Gauge data provided by Reclamation (Reclamation 2019, pp. 14-15) show that effects of temporary low flows likely do not extend much farther than Benham Falls (BENO Gauge), instead of all the way to the Colorado Street Bridge as previously anticipated. However, the low flows for inspection and maintenance are now proposed to be two weeks longer below Wickiup Dam, and the low flows would occur for more consecutive years than previously proposed (4 times instead of 2). Based on our analysis and findings in the 2017 Opinion and consideration of the revised proposed action, we conclude that the revised schedule for planned inspection and maintenance activities is likely to cause adverse effects to PCEs 1, 2, and 3 of spotted frog CH in Critical Habitat Sub-Units 8a and 8b, and these effects are more severe than previously anticipated in the 2017 Opinion due to the increased duration of low flows.

Effects of Interrelated Actions - Planned Maintenance and Inspection Activities at Crescent Dam

The Tumalo Irrigation District is planning routine maintenance and inspection activities at Crescent Dam in the fall of 2019 that were not addressed in the 2017 Opinion. Maintenance activities involve repairing a gate, removing rocks from the ramp flume, removing rocks from the tailrace and fully opening a gate to allow for flows of approximately 40 cfs. The proposed activities will occur over a 2 to 6-hour time period in the late fall season. The short duration of the proposed maintenance work combined with timing in the fall to coincide with rain events will result in little reduction of flows within spotted frog habitat. Springs and tributaries, such as Big Marsh Creek, which are not influenced by dam operations, will continue to provide water to spotted frog habitats as maintenance activities are conducted and the Service anticipates negligible effects to the spotted frog and its habitat, inclusive of CH, from these actions.

Effects of Variability in Spring Flows in Deschutes River Reaches 1 and 2

As described in the environmental baseline and effects of the action sections above, we expected adverse effects to spotted frogs and their CH in Deschutes River reaches 1 and 2 during the spring of 2019 as a result of large drops in discharge between April 30 and June 30. Under the revised proposed action, these effects are likely to be extended for up to an additional 17 months through the spring of 2020. Large drops in discharge during the spotted frog rearing period, especially if they dip below 900 cfs, are likely to adversely affect PCEs 1 and 2 of spotted frog CH.

Cumulative Effects

During the additional 17 months of the revised proposed action, the Service is not aware of any future State, Tribal, local or private activities, other than those likely to be implemented by the irrigation districts as part of the Federal action considered herein, that are reasonably certain to occur within the action area and that may affect the spotted frog and its CH.

As discussed in the 2017 Opinion, the Service anticipates that the nine prospective applicants for an incidental take permit (ITP) to take the spotted frog in conjunction with irrigation water management activities in the Deschutes River Basin will be submitting a draft Habitat Conservation Plan (HCP) for the spotted frog in support of their application pursuant to the requirements of section 10(a)(1)(B) of the ESA. It is the Service's expectation that the HCP will include conservation measures that significantly improve the environmental baseline conditions for spotted frogs and its CH in the action area. The Service will complete a formal consultation and prepare a biological opinion on the effects of the proposed ITP action on the spotted frog and its CH pursuant to our duties and responsibilities under section 7(a)(2) of the ESA. The Service anticipates publication of a draft HCP and draft Environmental Impact Statement developed pursuant to the requirements of the National Environmental Policy Act (NEPA) (42 U.S.C. §§ 4321–4370 et seq.) in the Federal Register on or around September 27, 2019.

Integration and Synthesis

The jeopardy and adverse modification analyses presented in the 2017 Opinion (Service 2017, pp. 194-205) remain accurate for the action as originally proposed. This memorandum is supplementing those analyses with our assessment of the effects of extending the proposed action for an additional 17 months, and new section 7(a)(2) determinations.

The current condition of the spotted frog and its CH in the action area is still highly degraded due to the impacts of past and ongoing irrigation water storage and delivery activities conducted by irrigation districts in coordination with Reclamation that have radically altered the natural hydrology of this portion of the Deschutes River Basin. Synchronizing and modifying, as needed, water management activities within the action area to ensure the proper function of habitats that support all spotted frog life stages and to ensure connectivity within suitable habitat areas and between spotted frog populations are vital to the survival and recovery of this species. Implementation of the OSF Proposal over a two-year period was a first step in that direction, and is already informing the development of the Deschutes River Basin HCP by the prospective applicants. An additional 17 months of implementation of the OSF proposal will continue to inform the completion of the HCP. The Deschutes River Basin HCP effort represents a highly significant opportunity to conserve spotted frogs by aligning irrigation water management in the basin to closely conform to and support the life history requirements of the spotted frog and the proper function of its CH.

Adjustments in the RiverWare model between 2017 and 2019 resulted in a decrease in the number of days (approximately 8 days) that flows in the Deschutes River were above 900 cfs, a threshold used in the 2017 Opinion for determining adverse effects to spotted frogs and their habitat. As described in the 2017 (pp. 133-134), the RiverWare model was used as a tool to conduct a coarse assessment of anticipated hydrological changes that would occur through implementation of the proposed action (i.e., the OSF Proposal and current action). The RiverWare model does not precisely predict actual flows in any given year due to inherent rule sets and natural variability in hydrology from year to year. Given that the 2017 Opinion did not rely wholly on the RiverWare modeling outputs to conduct our jeopardy analysis, changes in the model between 2017 and 2019 do not significantly change our analysis. Site-specific investigations of habitat function and population assessment were a critical piece of our 2017 analysis. For that reason, we do not anticipate that changes in outputs from the RiverWare model will result in additional impacts to spotted frogs caused by the revised proposed action over and above those described herein.

Extended implementation of the OSF Proposal is likely to continue to result in some temporary improvements to spotted frog habitat during critical periods of the spotted frog life cycle. These improvements are most evident at Crane Prairie Reservoir, a key location for maintaining genetic exchange between spotted frog populations located above the reservoir. Egg mass counts in the Crane Prairie Reservoir in 2018 and 2019 (Table 4) were higher than in 2017. Under the proposed action, some temporary improvements to spotted frog habitat along the Deschutes River, downstream of Wickiup Dam, are also likely to be occurring during the spotted frog breeding period. In particular, the earlier release of water from Wickiup Dam by April 1 may

facilitate an earlier initiation of breeding by spotted frogs. An earlier breeding effort facilitates an earlier (and longer) period of metamorphosis which is likely to result in more mobile spotted frogs in the early Fall when the irrigation storage season begins and wetlands supporting spotted frogs are drained. Overall, these temporary beneficial effects may improve the condition of the spotted frog population and function of spotted frog CH in the action area to support recovery of this species.

The adverse effects of new planned inspection and maintenance activities are likely to be more severe than previously anticipated in Deschutes River Reaches 1, 2, and 3 but are not expected to negate the temporary beneficial effects discussed above because increases in spotted frog reproduction are expected to outweigh the increased risk of spotted frog predation for hours to weeks in October. However, the newly described effects of variability in spring flows in Deschutes River reaches 1 and 2 significantly reduce the benefits to spotted frogs in the Upper Deschutes described above and in the 2017 Opinion. The death of a large portion of the tadpoles in reaches 1 and 2 during the spring of 2020 is likely to negate the OSF Proposal's benefit to spotted frog breeding areas in those reaches. Fortunately, those effects would occur in only a portion of the CH in the action area and affect only a few of the known spotted frog breeding areas in the action area. Furthermore, the Service supports implementation of Reclamation's proposed dam maintenance activities while winter flows in the Deschutes River are lower than we anticipate in the future under the Deschutes River Basin HCP.

We concluded in the 2017 Opinion that the OSF Proposal implemented over 2 years is not likely to jeopardize the continued existence of the spotted frog. Implementation of the proposed action over an additional 17 months (August 1, 2019, to December 31, 2020) is still not likely to jeopardize the spotted frog for the same two reasons relied upon in the 2017 Opinion: (1) improvements to spotted frog habitat at Crane Prairie reservoir are likely to increase survival of all life stages of spotted frogs over the new (extended) term of the proposed action within the Upper Deschutes River sub-basin; and (2) increased fall and winter flows from Crescent Lake in the Little Deschutes River sub-basin are likely to increase spotted frog survival within CH along Crescent Creek by extending the period of time in which spotted frog habitat is inundated. The proposed extended duration of the proposed actions and new adverse effects from planned inspection and maintenance activities would continue to maintain, but not appreciably deepen, the currently highly degraded baseline for the spotted frog and its CH in the action area for an additional 17 months until the HCP can be completed. We do not expect that this would preclude recovery in the action area or any larger scale for the two reasons presented above.

Conclusion

After reviewing the current status of the spotted frog and its CH, the environmental baseline for the action area, the effects of Reclamation's OSF Proposal and the cumulative effects, it is the Service's biological opinion that the OSF Proposal, as revised, is not likely to jeopardize the continued existence of the spotted frog, and is not likely to destroy or adversely modify spotted frog CH. The Service reached these conclusions for the reasons discussed in the 2017 Opinion and the findings presented above.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. *Harm* is defined by the Service as an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavior patterns, including breeding, feeding, or sheltering (50 CFR 17.3). *Harass* is defined by the Service as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering (50 CFR 17.3). Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this ITS.

The measures described below are non-discretionary, and must be undertaken by Reclamation so that they become binding conditions of any grant or permit issued to an applicant, as appropriate, for the exemption in section 7(o)(2) to apply. Reclamation has a continuing duty to regulate the activity covered by this ITS. If Reclamation (1) fails to assume and implement the terms and conditions or (2) fails to require an applicant to adhere to the terms and conditions of the ITS through enforce able terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, Reclamation must report the progress of the action and its impact on the species to the Service as specified in this ITS [50 CFR 402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE

Two years of proposed activities have already occurred that were covered under the ITS in the 2017 Opinion. The effects analyses above , describing the drop in water levels in Deschutes River reaches 1 and 2 in May 2019 were not analyzed in the 2017 Opinion but did not exceed the take that was anticipated in the ITS accompanying that Opinion. In this ITS, the Service has included an additional T & C (#18) to reduce that impact should it occur again in 2020. This ITS addresses anticipated levels of take caused by the additional 17 months of activities that Reclamation is proposing to conduct under the revised proposed action. Changes to the ITS from 2017 are indicated in **bold** font.

Form of Take

Based on the findings presented above in the *Effects of the Action* section, incidental take of the spotted frogs is anticipated in the form of harm and harass as a result of altered habitat conditions (including increased exposure of spotted frog life stages to desiccation and predation by birds, snakes, small terrestrial mammals such as mink or raccoons, and fish) caused by the revised proposed action.

Amount or Extent of Take

Detection of killed or injured individual eggs, tadpoles, juveniles, sub-adults, and adult spotted frogs will be very difficult to detect due to their small size, cryptic coloration, dependence on aquatic environments, and the nature of the take impact (e.g., consumption by predatory fish). For those reasons, it is not practical to monitor take impacts in terms of individual spotted frogs.

Pursuant to the authority of section 402.14(i)(1)(i) of the implementing regulations for section 7 of the ESA (80 FR 26832), a surrogate can be used to express the amount or extent of anticipated take if the following criteria are met: (1) the causal link between the surrogate and take is described; (2) an explanation is provided as to why it is not practical to express the amount or extent of take or to monitor take-related impacts in terms of individuals of the listed species; and (3) a clear standard is set for determining when the level of anticipated take has been exceeded.

For purposes of this ITS, a combination of affected wetland acres, storage volumes, and gauge flow rates in specific geographic areas are used as surrogates for establishing the extent of spotted frog take likely to be caused by the proposed action. The causal link (criterion 1) between each of these surrogates and the biological effects of the revised proposed action on the spotted frog that conform to the regulatory definitions of take is described in detail for specific geographic areas in the *Effects of the Action* section above. The basis for meeting Criterion 2 is discussed above. The basis for compliance with regulatory criterion 3 is described below.

NOTE: For some reaches, it was not possible to establish a surrogate for the amount or extent of take or to define a take exceedance criterion due to complex and variable hydrological and other site-specific conditions. As discussed above, because monitoring of take impacts in terms of individual spotted frogs is not practical, exempting a specific (estimated) number of individual spotted frogs for those reaches was not done in this ITS. In those cases, the level of exempted take in that reach was all spotted frogs exposed to revised proposed action-induced stressor(s), such as de-watering of habitat likely to be occupied by spotted frogs. For purposes of this ITS, the sites for which a surrogate and a take exceedance trigger could be defined serve collectively as the standard for determining when the level of exempted take under this ITS has been exceeded (see Table 6 below).

In the Upper Deschutes River sub-basin, the surrogates for quantifying take are a combination of storage volumes and wetland habitat acres in the reservoir system in the area above Wickiup Dam. In the area below Wickiup Dam the surrogates for quantifying take are a combination of river flow rates and wetland habitat acres by river reach.

Above Wickiup Dam, reservoir storage volumes influence the level of inundation within wetlands (approximately 583 acres) that provide habitat for spotted frogs. Within Crane Prairie reservoir we know that a reservoir storage volume of 45,000 acre-feet inundates a large area of the wetlands within the reservoir. The revised proposed action implements reservoir operations that require that storage volumes in Crane Prairie will reach at least 45,000 acre-feet by March 15. Between May 1st and May 15th, additional water may be stored in Crane Prairie Reservoir

until the total volume reaches 50,000 acre-feet and covering the full surface area of wetlands within the reservoir with water that spotted frogs are likely to utilize. Beginning on July 16, reservoir storage (greater than 35,000 acre-feet) will be drawn down until reaching 35,000 acre feet at the end of the irrigation season. During this period when the wetlands are draining (July 16 to October 15), pre-metamorphic, juvenile, adult and sub-adult spotted frogs are likely to be harmed through desiccation and predation. Reservoir storage volumes will remain either at 35,000 acre- feet or increase until reaching 45,000 acre-feet by March 15 the following year. At low storage volumes, spotted frogs that overwinter within the reservoir are likely to be harmed by fish that prey upon them.

Downstream from Crane Prairie, there are approximately 2,961 acres of wetlands within the 10,231 acres comprising Wickiup Reservoir that extend into the floodplain of the Deschutes River between Crane Prairie and Wickiup reservoirs, described above. The floodplain wetlands along the Deschutes River are influenced by both flow releases from Crane Prairie Dam and storage volumes in Wickiup Reservoir. Wetlands within Wickiup Reservoir are influenced mainly by the storage volumes that are high (up to 200,000 acre-feet) in the spring and rapidly drain as storage volumes decrease during the irrigation season. These extreme changes in hydrological condition likely preclude the establishment of a persistent spotted frog population within Wickiup Reservoir. This area currently functions as a "sink" for spotted frogs; small, incipient populations are likely established within the wetlands at Wickiup Reservoir annually from upstream source areas only to be eliminated by the rapid de-watering of these wetlands during the irrigation season. Operation of the reservoir via the proposed action will perpetuate this cycle. During the irrigation season and extending into the irrigation water storage season (April 1 through October 15), all or most of the spotted frogs in various life stages (embryos, tadpoles, juvenile, sub-adults and adults) that are present within the reservoir are likely to be stranded, desiccated and preyed upon as water drains from the wetlands as a result of the proposed action. Spotted frogs that overwinter within the residual storage volume of water within Wickiup Reservoir and the Deschutes River between the reservoirs are likely to be exposed to predation by brown trout that are concentrated in the residual reservoir pool.

Below Wickiup Dam, a surrogate for the amount or extent of spotted frog take can be expressed in terms of the extent of wetland acres (likely to be occupied by spotted frogs) that are de-watered when river flows, as measured by hydrological gauges at WICO and BENO, drop below specific flow thresholds identified in Table 54 [of the 2017 Opinion]. In general, the timing of the take impact occurs in the fall when the river is ramped down in September and October so that storage of water may begin in the reservoirs upstream. As water drains from the wetlands, juvenile, subadult and adult spotted frogs are likely to be harmed by avian and terrestrial predators due to the lack of cover provided by water and emergent vegetation. Low flows of 100 cfs that remain in the river through winter under the proposed action are also likely to harm spotted frogs that are forced to overwinter in the river channel where habitat quality and quantity is vastly reduced. Spotted frogs overwintering within the Deschutes River are likely to be preyed upon by brown trout since refugia habitat becomes scarce when the wetland habitats are drained. Overall, spotted frogs are reasonably certain to experience a restriction in movement, a reduction in cover, and stranding that exposes them to predation within approximately 1,227 acres of wetlands adjacent to 57 miles of the Deschutes River downstream of Wickiup Dam.

Under the proposed action, when Deschutes River flows are managed below 900 cfs as measured at the WICO gauge during the breeding and early rearing period (March 15 to **June 29**), most spotted frogs within 633 acres of wetlands in Deschutes River Reaches 1 and 2 are exposed to habitat loss and degradation (due to a reduction in cover) that increases their exposure to avian and terrestrial predation. Egg masses and emerging tadpoles also are at increased risk of predation and exposure to freezing and overheating due to the lack of cover and shallow water depths. As flows are reduced below 900 cfs in September, juvenile, subadult and adult spotted frogs are once again at increased risk of predation as wetlands are dewatered. Movement between rearing and overwintering habitat is restricted and spotted frogs are subject to predation. The proposed action is likely to harm spotted frogs between September 15 and **June 29** of the following year when Deschutes River flows are well below 900 cfs and there is limited habitat available to them from fall, through winter and into spring.

In Deschutes River Reach 3, when Deschutes River flows are below 1,000 cfs, as measured at the WICO gauge, some spotted frog egg masses and emerging tadpoles are likely to strand due to the delay in inundation of 115 acres of wetlands on private land that is managed by weirs in Sunriver. The timing of this stranding is likely to occur between March 15 and **June 29**. On approximately 171 acres outside of the area managed by weirs, spotted frog movement is also likely to be restricted and spotted frogs are likely to be stranded and preyed upon as water drains from wetlands as the irrigation storage season begins under the proposed action. The timing of this impact is likely to occur in September and extend until the following April during which timethe flows at the BENO gauge are reduced below 1,200 cfs.

In Reach 4, some spotted frogs within approximately 198 acres of wetland habitat along 3 miles of river are likely to be subject to restricted movement and exposed to an increased risk of stranding due to de-watering of habitat as flows at the BENO gauge are reduced below 1,600 cfs in September and further reduced shortly thereafter to below 1,200 cfs. As flows are reduced below these thresholds, most juvenile, subadult and adult spotted frogs using these wetlands are exposed to an increased risk of predation by aquatic and terrestrial predators.

In the spring, when flows are below 1,200 cfs, most of the 198 acres of wetland habitat within Reach 4 are not inundated by the river. Until flows reach 1,600 cfs at the BENO gauge in the spring, spotted frogs within these wetlands are concentrated into small areas and egg masses and emerging tadpoles are at increased risk of stranding and desiccation. Spotted frogs in Reach 4 are also exposed to increased predation as they utilize areas without vegetated cover for breeding.

In Reach 6, all spotted frogs within 7 acres of wetlands are likely to be killed when flows are reduced for the irrigation storage season. The timing of this impact is likely to occur in September under the proposed action. Based on limited field observations by Service staff, this area is likely functioning as a sink for spotted frogs.

In Reach 7, some spotted frogs within 8 acres of the LSA Marsh in the Old Mill District are likely to be subject to a significant disruption of their breeding, feeding, and sheltering behavior

to an extent that creates the likelihood of injury. This impact will be caused by a reduction in the quality of spotted frog overwintering and breeding habitat caused by lower winter flows under the proposed action that are likely to affect spotted frog selection of overwintering sites. The proposed action is also likely to result in higher flows during the spotted frog spring breeding period which are likely to restrict spotted frog use of a portion of the marsh for breeding.

Table 6. Extent of anticipated take during the extended term of the proposed action from August 1, 2019, to December 31, 2020.

Location	Surrogate	Form of take	Conditions that reflect take exceedance
Upper Deschutes River Sub-basin Above Wickiup Dam			
Crane Prairie Reservoir	583 acres of dewatered wetlands between July 16 and October 15 (drawdown period) Number of days where storage volumes are at 35,000 acre-feet between October 15 and March 15	Harm and harass	Storage volumes below 45,000 acre-feet on March 15; Storage volumes below 45,000 acre-feet between March 15 and July 15; Earlier drawdown than July 15; Storage volumes are <35,000 acre-feet at any time of the year
Wickiup Reservoir, including Deschutes River wetlands between reservoirs	2,961 acres of dewatered wetland acres between April 1 and October 15 as storage volumes are reduced below 200,000 acre feet (i.e., maximum storage volume).	Harm and harass	All spotted frogs within the reservoir are anticipated to be taken annually.
Upper Deschutes River Sub-basin Below Wickiup Dam			
1: Wickiup Dam to Fall River (includes monitored spotted frog sites at Bull Bend, Dead Slough and La Pine SP SW Slough) 2: Fall River to Little Deschutes (includes monitored spotted frog sites on private land at RM 202 and 195)	633 acres of dewatered wetlands as flows at the WICO gauge are <900 cfs between September 15 and **June 29**.	Harm and harass	Flows at WICO gauge <900 cfs between June 30 and September 14
3: Little Deschutes to Benham Falls (includes Sunriver)	115 acres shallow breeding and rearing habitat within wetlands in Sunriver when flows at WICO gauge are	Harm and harass	Flows at WICO gauge are <1,000 between June 30 and September 14

	<1,000 cfs between March 15 to **June 29**; 171 acres of dewatered riverine wetlands when flows at BENO are <1200 cfs (not including Sunriver) between September 15 and April 30.		Flows at BENO are <1,200 cfs between May 1 and September 14
4: Benham to Dillon Falls (includes monitored spotted frog sites at East Slough Camp and S. Ryan Ranch)	198 acres of dewatered wetlands when flows at BENO drop below 1,600 and 1,200 cfs between September 15 to April 30	Harm and harass	Flows <1,200 cfs at the BENO gauge between May 1 and September 14 Flows <1,600 cfs at the BENO gauge between May 1 and September 14
6: Lava Island Falls to COID diversion (includes monitored spotted frog site on private land at RM 172)	7 acres from September 15 to April 30	Harm	All spotted frogs within 7 acres are anticipated to be taken annually.
7: COID Diversion to Colorado Street Bridge (includes LSA Marsh in Old Mill)	8 acres from September 15 to April 30	Harass	N/D
Little Deschutes River Sub-basin			
Crescent Creek	1,182 acres when flows at CREO gauge are <90 cfs between **September 15** to November 30.	Harm and harass	N/D

ND = Not defined. Based on best available information, take exceedance thresholds for these reaches could not be defined. **NOTE:** Take is not reasonably certain to occur within 95 acres of wetlands in Reach 5 because spotted frogs have not been detected in this reach. Take is not reasonably certain to occur within the 3,322 acres of the Little Deschutes River downstream of the confluence of Crescent Creek because these acres are not as likely to be affected by the CREO gauge, flow thresholds for wetland inundation have not been established through monitoring, natural hydrological inputs from the upper Little Deschutes River watershed is likely to support habitat and there is an abundance of suitable habitat that remains through the winter for spotted frogs in this reach of the Little Deschutes River.

In the Little Deschutes River sub-basin, the proposed action is likely to harm some spotted frogs as a result of de-watering within 1,182 acres of wetland habitats along approximately 30 miles of Crescent Creek. The timing of this impact is most likely to occur in the fall (September) as flows at the CREO gauge are reduced below 90 cfs during an important period of spotted frog movement to overwintering habitat. Spotted frogs in wetland habitats along Crescent Creek are likely to be exposed to increased avian and terrestrial predation when cover is lost due to the de-watering of wetlands as flows at the CREO gauge are reduced below 90 cfs. When spotted frogs move to Crescent Creek from adjacent wetlands as a result of a reduction in flows under the proposed action, they are also subject to increased predation from brown trout along approximately 29 miles of the creek.

Given the abundance of off-channel oxbows along Crescent Creek that maintain water (although at lower levels) through the fall drawdown and into the winter when increased precipitation results in increasing water levels in oxbows, spotted frogs are likely to persist in overwintering habitats that receive additional flows (i.e., approximately 24 cfs) from the CREO gauge under the proposed action. Therefore, the take exemption for spotted frogs in wetlands adjacent to Crescent Creek within the Little Deschutes River sub-basin applies only for the period of September 15 to November 30 (annually).

EFFECT OF THE TAKE

In this Opinion, which incorporates the 2017 Opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the spotted frog or adverse modification of spotted frog CH.

REASONABLE AND PRUDENT MEASURES

The following RPMs and terms and conditions (Ts&Cs) address monitoring and reporting requirements or actions to minimize the impacts of anticipated take of the spotted frog. Most of the following RPMs addressing take of the spotted frog have not changed from the ITS accompanying the 2017 Opinion. However, some of the RPMs and their implementing Ts&Cs were completed during the first two years of the revised proposed action. Those completed measures, for the sake of transparency, have been retained below but are now depicted in italics and the outcome of implementing these measures is described in bold font. The balance of the RPMs described below apply the final 17 months of the proposed action. There is also a new RPM (#10) developed in response to unanticipated large drops in river water volume during the spring of 2019 in reaches 1 and 2.

The following RPMs are necessary and appropriate to monitor the impact of incidental take of the spotted frog caused by the revised proposed action:

1. Reclamation and the Districts shall monitor storage volumes at Crane Prairie Reservoir and flow rates at the WICO, BENO, and CREO hydrological gauges in order to provide advance notice to the Service of irrigation water storage and release operations that are likely to exceed the take levels exempted in this ITS. Reclamation and the Districts shall identify opportunities to adjust Project operations to avoid that exceedance.

2. *Reclamation and the Districts shall monitor hydrological conditions within Wickiup Reservoir, the Deschutes River between Wickiup and Crane Prairie reservoirs, Deschutes River Reaches 5-7, and the Little Deschutes River to determine the storage volumes and flow rates that are necessary to inundate wetland habitats whose proper function are key to supporting a well distributed and viable population of the spotted frog in the action area.* **Some monitoring is complete (see Vaughn 2018 and Vaughn 2019).**

3. *Reclamation and the Districts shall conduct biological monitoring to determine the effectiveness of the Proposed Action in reducing spotted frog take impacts at Crane Prairie Reservoir.* **This study has been conducted by USGS and the results will be presented in a draft manuscript.**

4. Reclamation and the Districts shall continue to provide funding or other support to on-going inter-agency efforts to conduct annual spotted frog breeding counts within the Action Area.

5. *Reclamation and the Districts shall, in coordination with the Service, develop an adaptive management plan that relies on the monitoring programs set forth under measures (1) and (2) above to address operational situations that may cause exceedance of the exempted levels of spotted frog take and modifications of those operations to avoid that exceedance. The plan shall also address opportunities for modifying Project operations under hydrological conditions where additional benefits to spotted frog reproduction, numbers, and distribution within the action area can be accrued.* **Adaptive management of the proposed action is ongoing. The Service received an Operations and Monitoring Plan from the Districts in March 2018 (COID, NUID and TID 2018) which outlines implementation of the T&Cs in the 2017 Opinion and anticipated coordination between Districts and the Service.**

6. *Reclamation and the Districts shall work with the Service and other inter-agency partners to validate the RiverWare model as a tool for analyzing how Project operations are affecting spotted frogs and its habitat with respect to the timing, volume, and duration of river flows.* **Validation of the RiverWare model is complete.**

7. During the irrigation season, Reclamation and the Districts shall coordinate with the Oregon Water Resources Department and the Service on adjusting ramp-up and ramp-down operations to maximize the minimization of spotted frog take impacts. **This coordination has occurred and is ongoing.**

8. Reclamation and the Districts shall increase winter flows in the Deschutes River, where feasible (e.g., as described in the Proposed Action during extreme run off events), to improve winter habitat conditions and survival of spotted frogs in the Action Area. **During the winter of 2017-2018 the outflow from Wickiup Dam to the Deschutes River was increased to 200 cfs.**

9. Reclamation and the Districts shall prepare an annual report summarizing all Project-related monitoring activities specified under this incidental take statement. The report shall be submitted to the Service by February 1, 2020 (describing 2019) and by February 1, 2021 (describing 2020). **Reports for 2018 and 2019 were submitted to the Service.**

10. Reclamation and the Districts shall reduce the impact of anticipated take during the months of May and June by moderating the variability of spring releases from Wickiup Dam.

TERMS AND CONDITIONS

Most of the Ts&Cs addressing the spotted frog have not changed from the ITS accompanying the 2017 Opinion. However, some of the Ts&Cs were completed during the first two years of the proposed action. Those completed Ts&Cs, for the sake of transparency, have been retained below but are now in italics and the product of that implementation is described in bold font. The balance of the Ts&Cs, however, shall be implemented for the final 17 months of the revised proposed action. There is also a new T&C (#18) developed in response to unanticipated large drops in river water volume during the spring of 2019 in Deschutes River reaches 1 and 2.

In order to be exempt from the prohibitions of section 9 of the ESA, Reclamation must comply with the following Ts&Cs, which implement the RPMs described above and outline required reporting/monitoring requirements. These Ts&Cs are non-discretionary.

The following Ts&Cs implement the RPMs to minimize and monitor the impacts of taking of the spotted frog caused by the revised proposed action. In accordance with these Ts&Cs, Reclamation shall submit a summary report to the Service (Attn: Bend Fish and Wildlife Field Office) by February 1 each year that covers each of these Ts&Cs:

Ts&Cs necessary to implement RPM 1:

1. Monitor storage volumes at Crane Prairie Reservoir to determine when water management operations may be approaching take thresholds as identified in Table 55 [of the 2017 Opinion and ITS]. Notify the Service if there are operational issues associated with managing the reservoir to reach targeted storage volumes as identified in the Proposed Action.

2. Notify the Service when drawdown of the Crane Prairie reservoir is anticipated to commence.

3. Monitor Deschutes River flow rates, as measured by the WICO and BENO gauges, to determine when water management operations may be approaching take thresholds as identified in Table 55 [of the 2017 Opinion and ITS].

4. In coordination with the Service, develop opportunities to observe on-the-ground habitat conditions at and below the flow thresholds identified for take of the spotted frog. For example, flows of 900 cfs could be observed over a couple of days on the ground through Reaches 1 and 2.

Ts&Cs necessary to implement RPM 2:

5. *Conduct hydrological and biological monitoring within the Deschutes River floodplain wetlands between the reservoirs to assess influence of operational changes at the CRAO gauge with habitat condition and spotted frog presence.* **Monitoring is complete (Vaughn 2019).**

a. *Hydrological monitoring methods shall be coordinated with qualified hydrologists and the Service as approaches will vary depending on the location within the action area. Approaches to gathering hydrological information will resemble those outlined in the monitoring section, above, and may include additional tools and methods.*

6. Monitor Wickiup Reservoir wetlands to determine storage volumes that provide suitable wetland habitat conditions for spotted frogs.

7. *Determine what flow volumes are likely to inundate wetlands in Reaches 5, 6 and 7 and identify how best to measure these volumes.* **Complete for Reach 7 (Vaughn 2018). Data collection in Reaches 5 and 6 is ongoing.**

8. In the Little Deschutes River system (Crescent Creek and Little Deschutes River), develop an approach to determining flows rates and methods for monitoring those flow rates that inundate spotted frog habitat. Assessment methods shall be designed by a qualified hydrologist and approved by the Service.

Ts&Cs necessary to implement RPM 3:

9. *Reclamation and the Districts shall fund a qualified party to prepare and implement a study to assess spotted frog habitat utilization at Crane Prairie Reservoir in 2018 and 2019, inclusive of conducting radio telemetry work, to elucidate spotted frog overwinter habitat selection preferences at the reservoir. The study shall be developed in coordination with and the approval of the Service by January 15, 2018. A funding agreement or other appropriate legal instrument to implement the study shall be executed between Reclamation, the Districts, and the qualified party by no later than January 30, 2018.* **This study has been conducted by USGS and a draft manuscript is anticipated in early 2020.**

Ts&Cs necessary to implement RPM 4:

10. Reclamation and the Districts shall fund a qualified party (e.g., USGS), approved by the Service, to conduct annual breeding surveys for spotted frogs in the action area in 2020. The survey plan shall be developed in coordination with and the approval of the Service by January 15, 2020.

11. Reclamation and Districts shall participate in and provide resources to interagency efforts to conduct spotted frog breeding surveys that begin in mid-March. Coordination meetings will be initiated by the Service in February, prior to the breeding season.

Ts&Cs necessary to implement RPM 5:

12. Reclamation and the Districts shall prepare, in coordination with and the approval of the Service, and implement the adaptive management plan by February 1, 2020. **Adaptive management of the proposed action is ongoing.**

Ts&Cs necessary to implement RPM 6:

13. *The RiverWare model has limitations in precisely predicting flows at the various gauges that were relied upon for assessing take of spotted frogs in this Opinion. The Effects of the Action analysis above provided examples of where the modeled output for the Proposed Action did not reflect water operations that occurred during the 2017 Water Year when the OSF Proposal was being implemented as per the Settlement Agreement. For this reason, Reclamation must meet with irrigation district managers, the Water Resources Department, and the Service to review the modeled hydrographs to assess where there may be inaccuracies in how the model is predicting river flows since the RiverWare model is likely be relied upon as a tool for assessing the flow scenarios for the Deschutes Basin HCP.* **Validation of RiverWare model is complete.**

Ts&Cs necessary to implement RPM 7:

14. In coordination with OWRD, Reclamation and Districts shall provide the Service with a ramp down schedule for Wickiup Dam by the end of the third week in September.

15. During the spring irrigation season ramp up at Wickiup Dam that coincides with the spotted frog breeding season, Reclamation and Districts, in coordination with OWRD, shall communicate weekly plans to increase flows in the Deschutes River above 600 cfs in the month of April.

Ts&Cs necessary to implement RPM 8:

16. Reclamation and the Districts shall convene a meeting with the Service annually in the month of November in calendar years 2019 and 2020 to discuss the feasibility of increasing winter flow conditions in the Deschutes River. A joint feasibility determination shall be made at that meeting.

Ts&Cs necessary to implement RPM 9:

17. The format of the report shall be developed in coordination with and approval by the Service. **The format of the report has been created and approved.**

Ts&Cs necessary to implement RPM 10:

18. Reclamation and the Districts shall not reduce flows at WICO to below 900 cfs in the months of May and June after flows have already exceeded 900 cfs in that season. Additionally, Reclamation and the Districts shall implement a WICO ramping-down rate of 10 percent per week during the months of May and June. **Given the uncertainty around how to implement this T & C in a manner that reduces the impact to spotted frogs while conveying and conserving water, ramping down in the spring season will be**

conducted in close coordination with the Service. Implementation of this T&C will further inform adaptive management for the Deschutes Basin HCP.

The RPMs, with their implementing Ts&Cs, are designed to minimize the impacts of incidental take on the spotted frog that might otherwise result from the proposed action. If, during the course of the action, the anticipated level of incidental take as described above is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the RPMs. Under such circumstances, Reclamation shall immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the RPMs.

If a dead, injured, or sick endangered or threatened species is located, initial notification shall be made to the Service's Division of Law Enforcement in Oregon at (503) 682-6131. Instruction for proper handling and disposition of such specimens will be issued by the Division of Law Enforcement. Care must be taken in handling sick or injured Oregon spotted frogs to ensure effective treatment, and care must be taken in handling dead specimens to preserve biological material in the best possible state for later analysis of cause of death. In conjunction with the care of sick or injured Oregon spotted frogs, or the preservation of biological materials from dead Oregon spotted frogs, Reclamation has the responsibility to ensure that information relative to the date, time, and location of the frog when found, and possible cause of injury or death of each salvaged Oregon spotted frog be recorded and provided to the Service's Division of Law Enforcement.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities designed to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

The Service recommends that Reclamation and/or the Irrigation Districts implement the following conservation measures:

1. Continue the close coordination with the Service in monitoring the status of the spotted frog in the area affected by the Deschutes Project.
2. Continue working towards developing a means of improving winter flow conditions in the Deschutes River downstream of Wickiup Dam from an operational and legal perspective. For example, consider converting the junior instream water rights of 300 cfs held by Oregon Department of Fish and Wildlife to a senior water right over time.
3. Reclamation should actively support the completion and implementation of the Deschutes River Basin HCP.
4. The Deschutes Basin HCP should include conservation measures for spotted frogs that increase winter flows within the Deschutes River below Wickiup Dam.

5. Reclamation and the irrigation districts should support on-farm water conservation to reduce demands on the Deschutes River flows.
6. Irrigation districts should enhance instream water leasing opportunities broadly and concurrent with modernization of the irrigation systems to address flow needs in the Deschutes River.
7. The irrigation districts, in cooperation with Oregon Water Resources Department, should install hydrological gauges that account for the natural volumes of water that feed into the Action Area within the Little Deschutes River sub-basin (i.e., Big Marsh Creek and Upper Little Deschutes River). Gauge data should be available via internet.
8. Given that there is no means of calculating the acres of wetland habitat that remain inundated through winter (during the irrigation storage season), the Service recommends that Reclamation fund LiDAR imagery for the Deschutes Basin at low flows (i.e., October flights before the snow) or "green" (bathymetric) LiDAR. Currently available LiDAR spatial layers for the Basin have been flow during high flows (irrigation season) and cannot be used for assessing winter conditions. Furthermore, the currently available LiDAR that has been flown during the summer irrigation season limits the ability to develop hydraulic modeling products that can assess the change in spatial inundation on the landscape over the changing hydrograph that occurs through storage and release operations.
9. Reclamation should implement a program to treat reed canary grass within the Deschutes Project Reservoir system and re-establish a diversity of native wetland vegetation in treated areas.
10. Reclamation should assist with bullfrog control within lands occupied by spotted frogs.
11. Reclamation should assist with establishing a conservation fund to implement projects to restore spotted frog habitat in the Basin.
12. In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or that benefit listed species or their habitats, the Service requests notification of the implementation of any of the above conservation recommendations.

REINITIATION NOTICE

This concludes the Service's biological opinion addressing the effects of the Proposed Action on the Oregon spotted frog and its CH. As provided in 50 CFR §402.16 re-initiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and if: (1) the amount or extent of incidental take is exceeded; (2) if new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not considered in this consultation opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or proposed critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by this action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending re-initiation.

If you have any questions regarding this Opinion, the amended take statement, or our shared responsibilities under the Endangered Species Act, please contact Jennifer O'Reilly of the Bend Fish and Wildlife Office at 541-312-6426.

LITERATURE CITED

Bureau of Reclamation. 2019. Supplemental Biological Assessment of Potential Effects to the Oregon Spotted Frog and its Critical Habitat from Approval of Changes to the 1938 Inter-district Agreement for the Operation of Wickiup and Crane Prairie Dams. Submitted to the U.S. Fish and Wildlife Service on June 17, 2019. 16pp.

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COID, NUID and TUID. 2018. 2018-2019 Operation and Monitoring Crane Prairie, Wickiup and Crescent Reservoirs. March 13, 2018. 8pp.

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U.S. Fish and Wildlife Service. 2017. Biological Opinion for Formal Consultation on the Approval of Contract Changes to the 1938 Inter-District Agreement for the Operation of Crane Prairie and Wickiup Dams, and Implementation of Review of Operations and Maintenance and Safety Evaluation of Existing Dams Programs at Crane Prairie and Wickiup Dams, Deschutes Project, Oregon (2017-2019). U.S. Fish and Wildlife Service Reference: 01EOFW00-2017-F-0528. Dated September 27, 2017. 270 pp.

Vaughn, M. 2018. Draft Update to DBHCP Chapter 8, Section 8.5.2, Wickiup Reservoir Wetland. pp. 3.

Vaughn, M. 2019. Draft report on the hydrology of Deschutes River Reach 7. Dated April 4, 2019. Pp. 6.

PERSONAL COMMUNICATIONS

Campbell, Eric. Campbell Environmental. May 31, 2019. Email communication with Jennifer O'Reilly, USFWS Bend Field Office, U.S. Fish and Wildlife Service, regarding bull frog captures/sightings during May 2017, 2018, and 2019.