Small Suction Dredge Mining Activity in the South Fork Clearwater River 2016–2022



State of Idaho

Department of Environmental Quality

November 2023

Acknowledgments

Craig Johnson (BLM), Hayden Lewis (USFS), Curtis Caton (USFS), Katherine Rhode (USFS), Ashley Hurst (USFS), and David Arthaud (NOAA-NMFS) provided USFS and BLM annual reports and data used for analyses. Comments DEQ received on a draft version of the report from the Nez Perce-Clearwater National Forest, Tenmile Mining District, Gary Bowling, Dan Kenney, Environmental Protection Agency, and the National Marine Fisheries Services improved the report. The cover photo is from *Bureau of Land Management 2020 Suction Dredging Monitoring Report for the South Fork Clearwater River*.

Prepared by
Jason Williams
Idaho Department of Environmental Quality
Lewiston Regional Office
1118 F St.
Lewiston, ID 83501

Accessibility Services: The Idaho Department of Environmental Quality will provide reasonable language access services and/or disability services for documents at no charge. To request an accommodation under Title VI of the Civil Rights Act of 1964 or Americans with Disabilities Act, contact DEQ's nondiscrimination coordinator at (208) 373-0271 or *accessibility@deq.idaho.gov*. Para obtener información en español, visite *https://www.deq.idaho.gov/about-us/accessibility/*.

DEQ. November 2023. Cost codes: 24530019.245028.10038. Costs associated with this publication are available from the State of Idaho Department of Environmental Quality in accordance with Idaho Code § 60-202.

Table of Contents

Abbreviations, Acronyms, and Symbols v
Executive Summary vi
1 Introduction 1
1.1 Regulatory Background 2
1.2 Objectives 6
2 Methods 7
2.1 Data Sources 7
2.1.1 Permitted Suction Dredging Locations 7
2.1.2 Permitted Suction Dredging Activity Data 8
2.1.3 Unauthorized Suction Dredging Activity Data 8
2.1.4 Nonmotorized Placer Mining 9
2.2 Dredging Activity Statistics 9
2.3 Turbidity 10
2.3.1 USFS and BLM Turbidity Monitoring 11
2.3.2 Miner Visual Turbidity Monitoring 12
3 Results 12
3.1 Dredging Locations 12
3.2 Number of Active Dredging Operations 13
3.2.1 Permitted Suction Dredge Operations 13
3.2.2 Unauthorized Suction Dredge Operations 13
3.3 Activity Statistics 14
3.4 Turbidity 17
4 Comparison of Suction Dredge Activity Measures to Applicable Requirements 17
4.1 Location 17
4.2 Timing 17
4.3 Number of Operations 17
4.4 Active Hours 17
4.5 Operation Volumetric Excavation Rates 18
4.6 Industry Daily Discharge Load 18
4.7 Industry Seasonal Discharge Load 20
4.8 Turbidity 20
5 Relationship Between Suction Dredge Activity Measures and Ecological Effects 21
6 Data Availability 23
7 References 23
Appendix A. USFS Summary of Compliance/Enforcement Actions Taken 26

List of Tables

Table A. Suction dredge activity measures and applicable requirements addressed in this report. viii
Table 1. Selected South Fork Clearwater River small suction dredge requirements by requirement source. 4
Table 2. Suction dredge activity measures and applicable requirements addressed in this report. 7
Table 3. Suction dredge activity statistics calculated for each active permitted operation 2016-2022. 10
Table 4. Suction dredge activity statistics calculated on an annual basis for the SFCR suction dredge industry. 10
Table 5. Industry annual suction dredging activity statistics.[a] 14
Table 6. Suction dredge operation activity statistics, calculated across all active operations with necessary data 2016-2022.[a] 14
Table 7. Summary of comparison of permitted suction dredge activity measures to applicable requirements. 20
Table 8. Stream substrate percent fines measurements for dredged reaches. 22

List of Figures

Figure 1. Suction dredging activity in the South Fork Clearwater River in 2017 (photo credit Johnson 2017). 1
Figure 2. Upstream points (orange triangles) for all reaches delineated for permitted dredging activity 2016–2022. Note that not all delineated reaches had dredging activity. 3
Figure 3. Calculated active hours per day for each permitted active dredge operation. 15
Figure 4. Calculated hourly operation volumetric excavation rates for each permitted active dredge operation. 15
Figure 5. Calculated daily operation volumetric excavation rates for each permitted active dredge operation. 15
Figure 6. Calculated daily operation excavated material load for each permitted active dredge operation. 15

Abbreviations, Acronyms, and Symbols

AIM	Assessment Inventory and Monitoring Program
BLM	Bureau of Land Management
CWA	Clean Water Act
DEQ	Idaho Department of Environmental Quality
EPA	US Environmental Protection Agency
ESA	Endangered Species Act
hr	hour
lb	pound
ICL	Idaho Conservation League
IDAPA	refers to citations of Idaho administrative rules
IDWR	Idaho Department of Water Resources
IPDES	Idaho Pollution Discharge Elimination System
mm	millimeter
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollution Discharge Elimination System
NTU	Nephelometric turbidity units
POO	Plan of Operations
SFCR	South Fork Clearwater River
TMDL	total maximum daily load
USFS	US Forest Service
UTM	Universal Transverse Mercator coordinates
WLA	wasteload allocation

Executive Summary

Why was this report developed?

This report was developed to document small suction dredge mining activity in the South Fork Clearwater River (SFCR) and evaluate mining industry compliance with several Clean Water Act requirements. The report focuses on 2016–2022 because current US Forest Service (USFS) and Bureau of Land Management (BLM) suction dredge management and monitoring protocols began in 2016, and 2022 was the most recent available finalized data.

What are the main points?

The Idaho Department of Environmental Quality (DEQ) used data provided by USFS and BLM to calculate several dredging activity measures (e.g., number of active operations, hours dredged/day, and area and volume of streambed material excavated). DEQ then compared activity measures to requirements established in the SFCR total maximum daily load (TMDL) and Idaho Pollution Discharge Elimination System (IPDES) general permit for small suction dredge miners in Idaho (general permit IDG370000, EPA 2018). The main conclusions are:

- This report is not a comprehensive analysis of SFCR suction dredge industry compliance with all applicable regulations. It is specific to the TMDL and IPDES permit requirements in Table A (page viii).
- Suction dredge activity data used to evaluate Clean Water Act compliance were a mixture of self-reported data from miner field logs and field measurements by USFS and BLM staff. For approximately half of active operations 2016-2022, excavated area and volume estimates were based solely on miner field logs because agency field measurements were not available. Agency staff indicated the level of agreement between miner logs and agency field measurements was often good, but also varied across operations.
- Based on compiled data, permitted small suction dredging activity met TMDL and IPDES requirements in Table A for each year 2016-2022 except 2018 and 2020, when unauthorized suction dredging occurred.
- The amount of unauthorized suction dredging in tributaries is poorly understood. The TMDL allows for suction dredging in tributaries, but the IPDES permit does not allow it because compliance with Endangered Species Act (ESA) section 7 requirements has not been documented by USFS or BLM. USFS reported unauthorized tributary suction dredging in 2018 and 2020 but also stated that USFS received reports of unauthorized suction dredging tributaries it could not confirm. Staff from all regulating agencies (DEQ, IDWR, BLM, USFS) focused compliance monitoring efforts primarily on the main stem SFCR due to limited resources.
- The TMDL and IPDES permit set suction dredge effluent turbidity requirements. However, turbidity measurements by USFS and BLM did not meet data quality requirements, so compliance with turbidity requirements was not evaluated.
- The TMDL and IPDES permit set requirements for sediment volume and load in suction dredge effluent, but these parameters have not been measured in the SFCR. USFS, BLM,

and miners estimate the volume of streambed material excavated based on suction dredge hole dimensions. But the fraction of excavated material that is taken up through a suction dredge intake pipe and then discharged as effluent has not been measured and likely varies across operations. Measured excavation rates (average: 0.3 cubic yards per hour [yd^3/hour], range: 0.03–1.5 yd^3/hour) were less than the 2 yd^3 sediment/hour effluent limit included in the TMDL and IPDES permit.

- The primary intent of TMDL and IPDES suction dredge regulations are to ensure suction dredging activity causes "minimal downstream increases in bedload or surface fine sediment levels below the area of active mining" and protects salmonid habitat and aquatic life (DEQ, EPA, and NPT 2004). However, it is not possible to assess if existing regulations achieve this goal using available suction dredge monitoring data. Agencies measured dredging activity (e.g., number of dredges and area and volume dredged) but did not consistently or adequately measure the presence, absence, or magnitude of sediment or ecological impacts. Data relating activity magnitude to the presence/absence and magnitude sediment effects, ecological effects, or to beneficial use support, are needed to evaluate if existing regulations are adequate, overprotective, or underprotective, and to guide any future regulation revisions.
- DEQ distributed a draft version of this report to partner agencies and the mining community, and received written comments from EPA, USFS, National Oceanic and Atmospheric Administration's (NOAA's) National Marine Fisheries Service (NMFS), Dan Kenney, and the Tenmile Mining District. Comment letters are available in supporting materials (*https://doi.org/10.17605/OSF.IO/3K2NE*). In response, DEQ added 2022 data, revised the executive summary, removed a comparison of suction dredge loads to river suspended sediment loads, added discussion of nonmotorized placer mining, added more details about USFS compliance actions, added more detailed information about sources of activity data used, and made several other minor edits.

What happens next?

Government agencies regulating SFCR suction dredging face legal mandates to periodically review, and if necessary, revise suction dredging regulations. DEQ must review existing IPDES permits and TMDLs every 5 years. In 2024, DEQ plans to issue a revised IPDES general permit for suction dredging activity in Idaho. In 2026, the current Biological Assessment and Biological Opinion governing USFS and BLM management of SFCR suction dredging expires and must be reevaluated by USFS, BLM, and NOAA-NMFS. Biological Assessments and Biological Opinions typically are reevaluated every 10 years.

This report documents suction dredge activity and Clean Water Act compliance information DEQ, USFS, BLM, NMFS, and IDWR can consider when reviewing existing regulations and planning monitoring efforts. In 2023, DEQ and USFS began a suction dredge monitoring pilot study to help fill the suction dredge ecological effects information gap. The pilot study is one component of the *South Fork Clearwater River Watershed Sediment Assessment Plan* (*https://doi.org/10.17605/OSF.IO/KFMYR*).

Table A. Suction dredge activity measures and applicable requirements addressed in this report.

	Measure	Requirement	Source	Outcome
1	Location	Main stem upstream of Harpster; dredging in tributaries requires approved IDWR/IPDES joint permit and ESA section 7 compliance	NPDES Permit IDG37000	Unauthorized tributary dredging in 2018 and 2020; otherwise, all known dredging occurred in main stem and requirements met
2	Timing	Dredging July 15–August 15 only	NPDES Permit IDG37000, TMDL	Requirement met
3	Number of operations	≤ 15 active operations/year	NPDES Permit IDG37000	Limit exceeded in 2018 due to unauthorized dredging; otherwise, requirement met
4	Active hours per day	≤ 8 hours/day activity per operation	NPDES Permit IDG37000	Requirement met for permitted operations, exceeded by 2018 unauthorized operations
5	Material processing rate [a]	≤ 2 yd^3/hour material processed per operation	NPDES Permit IDG37000	Requirement met; excavation rate < 2 yd^3/hour
6	Industry daily dredge effluent load	≤ 314 tons/day industry annual dredge effluent load	TMDL WLA	Requirement met. Industry daily excavated loads meet effluent load requirement
7	Industry seasonal dredge effluent load	≤ 9,734 tons/season (314 tons/day x 31 days)	Calculated based on TMDL WLA	Requirement met
8	Turbidity impacts	Turbidity ≤ 5 NTU over background and no visible turbidity plume ≥ 500 feet downstream of dredges	NPDES Permit IDG37000, TMDL WLA, DEQ 401 certification of NPDES permit	Insufficient turbidity measurement data; visual plume length requirement met

Notes: WLA = wasteload allocation; NTU = nephelometric turbidity units
a: the 2018 NPDES/IPDES permit states “permitees are limited to processing an average of 2 yd^3/hour over the period of an 8-hour day”, but did not define ‘processing’. This requirement was assumed to apply to dredge effluent because the permit states “The NPDES GP does not cover anything other than the discharge of wastewater from the suction dredge”.

1 Introduction

Suction dredge mining is a form of placer mining where a miner uses a vacuum nozzle to excavate and process streambed material within a wetted stream channel to search for gold or other precious metals (Harvey and Lisle 1998) (Figure 1). In Idaho, small suction dredge mining operations are defined as those using a 5-inch diameter or smaller vacuum nozzle and equipment rated at 15 horsepower or less (EPA 2018). Streambed material taken up through the nozzle is processed through a floating sluice box. Water and materials not retained in the sluice box are discharged into the water column through a discharge pipe, flume, or other conveyance as effluent. Miners typically excavate streambed materials larger than the dredge nozzle intake diameter by hand and place them elsewhere in the stream channel. Excavating streambed material by hand and through a suction dredge creates a depression in the streambed called a dredge hole (Box 1—Definitions). Miners typically backfill dredge holes using material moved by hand, cobbles or boulders from the stream channel, and tailings.



Figure 1. Suction dredging activity in the South Fork Clearwater River in 2017 (photo credit Johnson 2017).

Box 1—Definitions

Suction dredge operation: One or more suction dredges and miners that perform suction dredging activity in a defined stream or river reach.

Suction dredging activity: All suction dredging operation activity while an operation is interacting with the streambed, including where a miner moves streambed material by hand and where a miner processes streambed material through a dredge.

Dredge hole: A depression created in a streambed by a suction dredge operation by excavating streambed material, including moving by hand and processing streambed material through a dredge.

Excavated material: All streambed material moved by suction dredging activity, including both material miners move by hand that never is taken up by a suction dredge intake nozzle and material taken up by a dredge intake nozzle. Material moved by hand is often used to backfill a dredge hole when suction dredge activity is complete. In this analysis, excavated material volume was estimated using suction dredge hole volume measurements.

Suction dredge influent: All water and streambed material taken up by a suction dredge intake nozzle.

Suction dredge effluent: All water and material discharged from a suction dredge outtake nozzle, flume, or other discrete conveyance. Discharged effluent includes all intake material minus material captured by a sluice box and not subsequently returned to the stream channel by a miner.

1.1 Regulatory Background

Since 2016, up to 15 small suction dredging operations have been permitted to operate July 15–August 15 each year on the main stem South Fork Clearwater River (SFCR) upstream of Harpster, Idaho (Figure 2). Each operation must have written approval from three government agencies: a written authorization to discharge from the Idaho Department of Environmental Quality (DEQ) under an Idaho Pollution Discharge Elimination System (IPDES) permit to address Clean Water Act (CWA) requirements (EPA 2018); an approved South Fork Clearwater River Special Supplement application from the Idaho Department of Water Resources (IDWR) to address Idaho Stream Channel Protection Act requirements (IDWR 2023); and if the operation occurs within US Forest Service (USFS) or Bureau of Land Management (BLM) boundaries, an approved Plan of Operations (POO) from the jurisdictional land management agency to address land management agency and Endangered Species Act (ESA) requirements for protecting Snake River Basin steelhead (*Onchorhynchus mykiss*), Snake River fall Chinook (*O. tshawytscha*), and Bull Trout (*Salvelinus confluentus*) (USFS 2023a, USFS 2023b, USFS 2023c). Each agency requires

permitted miners to comply with various conditions intended to mitigate or prevent adverse effects on the stream channel and aquatic life (Table 1).

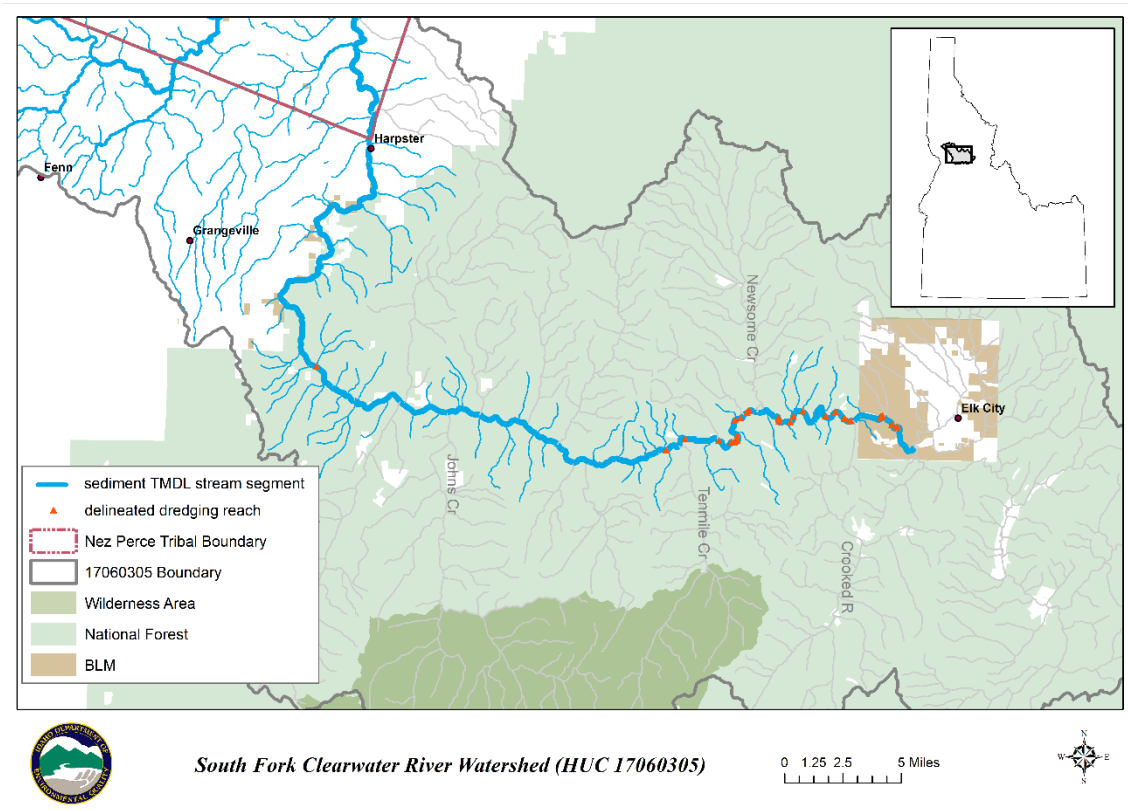


Figure 2. Upstream points (orange triangles) for all reaches delineated for permitted dredging activity 2016–2022. Note that not all delineated reaches had dredging activity.

Table 1. Selected South Fork Clearwater River small suction dredge requirements by requirement source.

Component	SF Clearwater TMDL (2004)	EPA NPDES Permit # IDG370000	USFS/BLM Plan of Operations	IDWR Recreational Mining Permit
Location	Main stem and tributaries upstream of Harpster Bridge	Main stem upstream of Harpster; dredging in tributaries requires approved IDWR/IPDES joint permit and ESA section 7 compliance.	Main stem above Harpster, at least 300 feet downstream from any perennial tributary	Entire main stem, at least 300 feet downstream from any perennial tributary; tributaries are closed to dredging.
Timing	July 15–August 15	July 15–August 15	July 15–August 15	July 15–August 15
# of dredges	No specific number, defined maximum industry discharge load based on assumed industry effort and outputs in 2004 (314 tons/day)	15 dredges	15 dredges	No limit on # of dredges
Effort	Maximum 2 yd^3/hour daily discharge average over 8-hour day per dredge	Maximum 2 yd^3/hour daily discharge average over 8-hour day per dredge	During daylight hours	No specific requirement
Spacing	At least 100 feet separation, no overlap of mixing zones	800 feet minimum distance between operating dredges; 500 feet mixing zone established by DEQ 401 certification of EPA's NPDES permit	At least 800 linear feet between active operations, or minimum distance required by NPDES permit (whichever is greater)	Dredges must be at least 100 feet apart
Dredge characteristics	≤ 5 inch nozzle, ≤ 15 horsepower, ≤ 2 yd^3/hr discharge	≤ 5 inch nozzle, ≤ 15 horsepower, screened intake nozzle	≤ 5 inch nozzle, ≤ 15 horsepower, intake nozzle 3/32-inch mesh screen	≤ 5 inch nozzle, ≤ 15 horsepower, intake nozzle 3/32-inch mesh screen
Turbidity	Downstream below mixing zone turbidity should not exceed background by > 5 NTU	Turbidity downstream of mixing zone (500 feet) should not exceed background by > 5 NTU; no visible turbidity plume beyond mixing zone (500 feet)	No visible or measured turbidity increase over background levels ≥ 150 feet downstream	No visible turbidity plume extending beyond 500 linear feet downstream of a suction dredge
Site inspection by fisheries biologist	Not explicitly required but requires compliance with all other applicable permitting processes, some of which require inspection	Not required, but requires compliance with all other applicable permit processes, some of which require inspection	Required	Required
Permit compliance	Each operation must comply with all applicable permitting processes.	Each operation must comply with all applicable permit processes	Each operation must comply with all applicable permit processes	Compliance with other permits is not a specific condition required in IDWR's permit
Regulation time period	Applies until the TMDL is revised or withdrawn.	2018–2022, administratively continued for 2023 season	2016–2026	Annually
Monitoring	Recommended interagency annual monitoring program to measure dredging effects	Miner self-reporting in miner annual report, permit compliance inspections for several dredges each year	Dredged hours, area, and volume records; dredge hole backfill verification; USFS turbidity monitoring for some dredges; USFS POO compliance annual report	IDWR inspections for some dredges, dredge hole backfill verification

Several permit conditions are based on the SFCR sediment total maximum daily load (TMDL) (DEQ, EPA, and NPT 2004). The main stem SFCR was listed as sediment-impaired under the CWA in 1994 because the US Environmental Protection Agency (EPA) determined excess sediment negatively affected aquatic life and salmonids. The CWA requires states to develop TMDLs for impaired waters, and EPA to review and either approve or disapprove TMDLs. TMDLs establish the maximum pollutant input daily loads (mass/day) that can occur from input sources while still meeting state water quality standards. The SFCR sediment TMDL includes a suction dredge wasteload allocation that establishes an industry-wide maximum daily dredge effluent load (314 tons/day) that can occur from suction dredges in the SFCR watershed upstream of Harpster and dredge operation turbidity requirements (DEQ, EPA, and NPT 2004).

The wasteload allocation and assumptions used to develop the TMDL were used as the basis for several permit conditions. The IPDES permit states "EPA would authorize no more than 15 suction dredges in any one year in accordance with the TMDL" and establishes effluent limitations specific to SFCR operations based on the TMDL (EPA 2018). Operations are limited to July 15–August 15 and in main stem or tributary reaches upstream of Harpster, can process up to 2 yd^3/hour over the period of an 8-hour day, and must meet TMDL turbidity requirements (EPA 2018). USFS and BLM also limit the number of POOs issued to 15, and included POO conditions for maximum suction dredge nozzle diameter, horsepower, and suction dredge spacing based on how TMDL requirements were implemented in the IPDES permit (USFS and BLM 2016; USFS 2023a).

The three permits (IPDES, IDWR, USFS/BLM) are interrelated in several important ways. First, miners must have an approved IDWR permit and required authorizations from USFS or BLM to receive an IPDES permit in the SFCR. The IPDES permit states that an IPDES permit will be issued only to SFCR IPDES permit applicants that "meet all the requirements of the joint EPA/IDWR/USFS/BLM (Bureau of Land Management) authorization processes…" (EPA 2018). Second, the POO includes a condition requiring miners to "comply with all additional conditions or measures stipulated in all necessary permits" (condition #21, USFS 2023b). Therefore, miner compliance with the POO depends on compliance with IDWR and IPDES permits. Third, IDWR's special supplement includes a condition requiring miners to "obtain an IPDES permit from DEQ before carrying out any mining activities authorized by this permit" (condition #4, IDWR 2023). Fourth, certain permit conditions were developed based on specific conditions included in one of the other permits. For example, USFS and BLM developed their process and conditions for permitting suction dredging assuming ≤ 15 operations would be permitted each year because the IPDES permit limited dredging to 15 operations.

The current small suction dredge IPDES permit to address CWA requirements was issued by EPA in 2018 (EPA 2018). This general permit regulates all small suction dredging operations in Idaho, including those in the SFCR. In contrast to an individual permit that has conditions developed specifically for one point source operation, a general permit covers multiple point source dischargers performing similar discharge activities. Small suction dredging operations in Idaho must apply for and receive coverage under the statewide suction dredging general IPDES

permit to operate. As noted above, the IPDES permit includes several conditions specific to the SFCR based on the TMDL wasteload allocation.

On July 1, 2020, DEQ assumed authority for administering all non storm water general permits for point sources in Idaho, including the statewide general permit for small suction dredging operations. The current IPDES permit expired May 31, 2023. DEQ administratively continued the current permit until an updated permit is issued (likely in 2024). DEQ's updated IPDES general permit will include conditions specific to the SFCR. Because federal law defines a TMDL wasteload allocation as a type of water quality-based effluent limitation (40 CFR 130.2h), IPDES permit effluent limitations for suction dredging in the SFCR must be at least equally protective as an existing TMDL wasteload allocation.

Because of how the permits are interrelated, if DEQ revises IPDES permit conditions specific to the SFCR watershed when reissuing the permit, other permitting agencies may choose to revise their permits or permit processing procedures. For example, the USFS POO design criteria and required mitigation measures state "If the rules or conditions associated with the relevant IDWR/EPA/DEQ permits are modified in a manner which could affect ESA-listed species in manner or magnitude not anticipated in this consultation, the Agencies would reinitiate consultation with the NMFS and/or FWS" (USFS 2023b). However, USFS, BLM, and NMFS would ultimately determine if changes to DEQ's permit merit reinitiating ESA consultation or POO changes.

To decide if and how to revise conditions specific to the SFCR in any of the existing permit processes, it is important to accurately quantify suction dredge activity and compliance levels under current regulations. When DEQ, EPA, and the Nez Perce Tribe developed the TMDL wasteload allocation and permit processes, they made assumptions about suction dredging activities, including but not limited to, the number of hours each operation dredged per day and the volume of material processed per day. Those assumptions were the basis for certain conditions in IDWR and USFS/BLM permit processes. Since 2016, miners and agencies have recorded various measures of dredging activity through miner field logs and agency field measurements, so these assumptions can now be evaluated.

1.2 Objectives

Objectives of this report are to:

1. Document and summarize selected measures of 2016–2022 small suction dredge activity in the SFCR (Table 2).
2. Compare suction dredging activity measures to applicable regulatory requirements established in the SFCR TMDL and IPDES general permit for small suction dredge miners in Idaho (general permit IDG370000; EPA 2018) (Table 2).

This report is not a comprehensive analysis of miner compliance with all applicable requirements across all permit processes but is specific to the requirements in Table 2.

Table 2. Suction dredge activity measures and applicable requirements addressed in this report.

	Measure	Requirement	Source
1	Location	Main stem upstream of Harpster; dredging in tributaries requires approved IDWR/IPDES joint permit and ESA section 7 compliance.	NPDES Permit IDG37000
2	Timing	July 15–August 15 only	NPDES Permit IDG37000, TMDL
3	Number of operations	≤ 15 active operations/year	NPDES Permit IDG37000
4	Active hours per day	≤ 8 hours/day activity per operation	NPDES Permit IDG37000
5	Material processing rate [a]	≤ 2 yd^3/hour material processed per operation	NPDES Permit IDG37000
7	Industry daily dredge effluent load	≤ 314 tons/day industry annual dredge effluent load	TMDL wasteload allocation
8	Industry seasonal dredge effluent load	≤ 9,734 tons/season (314 tons/day x 31 days)	Calculated based on TMDL wasteload allocation
9	Turbidity impacts	Turbidity ≤ 5 NTU over background and no visible turbidity plume ≥ 500 feet downstream of dredges	NPDES Permit IDG37000, TMDL wasteload allocation, DEQ 401 certification of EPA's NPDES permit

a: the 2018 NPDES/IPDES permit states "permitees are limited to processing an average of 2 yd^3/hour over the period of an 8-hour day", but did not define 'processing'. This requirement was assumed to apply to dredge effluent because the permit states "The NPDES GP does not cover anything other than the discharge of wastewater from the suction dredge".

2 Methods

2.1 Data Sources

DEQ requested 2016–2022 suction dredge monitoring data from USFS and BLM for the SFCR. USFS and BLM provided 2016-2021 postseason suction dredging reports documenting suction dredge locations and activity measures within the Nez Perce-Clearwater National Forest (Johnson 2016, 2017, 2018, 2020, 2021, 2022; Kenney 2016; Kenney and Donnelly 2018; Kenney et al. 2019, 2020; McKeag et al. 2021, 2022). Final reports for 2022 were not yet available when this document was developed, but USFS and BLM did provide 2022 data. USFS and BLM submit their annual reports to the National Oceanic and Atmospheric Administration's (NOAA's) National Marine Fisheries Service (NMFS) and US Fish and Wildlife Service each year to fulfill reporting requirements established by in NMFS Biological Opinions for suction dredging within the forest (NOAA 2016). In addition, USFS and BLM provided spreadsheets with dredging activity data used to develop the reports and latitude/longitude locations for each dredge reach delineated by USFS and BLM staff. DEQ compiled these data into a master dataset included in supporting materials (*https://doi.org/10.17605/OSF.IO/3K2NE*).

2.1.1 Permitted Suction Dredging Locations

For each permitted operation, IDWR and the POO require IDWR, USFS, or BLM staff to delineate reaches where suction dredging will occur. The compiled dataset includes coordinates for the upstream end of each delineated reach and reach length.

2.1.2 Permitted Suction Dredging Activity Data

For each permitted suction dredge operation in 2016–2022, the compiled dataset includes dredging start date and end date; total hours dredged; total days dredged; number of federal agency (USFS or BLM) inspections; whether or not USFS or BLM noted operation noncompliance with agency permit requirements; federal agency final inspection date; number of dredge holes produced by the operation; estimated dimensions (length, width, and depth) for each dredge hole; estimated total dredge hole area for the operation; and estimated total dredge hole volume for the operation.

For most operations, the compiled dataset also includes the source of dredge hole area and volume measurements (miner field logs, agency field measurements, or both). USFS and BLM require miners to complete daily logs documenting the duration of dredging activity, area and volume of streambed material dredged, and visually estimated maximum turbidity plume length. USFS and BLM also measure dredge hole dimensions (area, volume) in the field in some cases if they are present on site before a hole is backfilled. In cases where both agency measurements and miner-reported dredge hole dimensions were available, USFS and BLM staff selected the measurement value they considered most reliable. The compiled dataset reflects measurements USFS and BLM considered appropriate for use in their annual summary reports.

Among 65 active operations within USFS jurisdiction in 2016–2022, operation dredged area and volume data were based solely on USFS measurements for 16 (25%) operations, based on miner field logs for 34 (52%) operations, based on a mixture of USFS and miner data for 11 (17%) operations, and based on Tenmile Mining district records for 4 operations (6%). For active operations within BLM jurisdiction, BLM reported area and volume data were based on BLM field measurements, which in most cases closely matched miner field logs.

Total operation dredge volume data were not available for all operations 2016-2022. BLM reported dredge hole dimensions and volume for 2017-2022, and USFS reported dimensions and volume data only for 2019–2022. USFS and BLM did report operation total dredged area for each operation 2016-2022. Because of limited operation volume data 2016-2018, summary statistics for the total excavated volume across the industry could only be calculated 2019-2022. Methods for calculating summary statistics are described in detail below.

The compiled dataset only includes permitted suction dredging operations. The dataset does not include activity data for any unpermitted suction dredge operations (section 2.1.3 and section 3.2.2) or nonmotorized placer mining (section 2.1.4). Instances of unauthorized suction dredging are noted in section 2.1.3 and discussed Appendix A, but dredge activity data were not available for all cases of unauthorized suction dredging.

2.1.3 Unauthorized Suction Dredging Activity Data

Suction dredging activity is unauthorized when it occurs without obtaining all three permit approvals. Annual reports and documentation provided by USFS and BLM, and DEQ IPDES compliance documentation were used to inventory unauthorized suction dredging activity in 2016–2022. USFS provided records of recorded unauthorized suction dredging and USFS

compliance actions taken (Appendix A). USFS and BLM 2022 annual reports were not available at the time this document was developed. Therefore, any USFS and BLM documentation of unauthorized activity in their 2022 annual reports is not reflected in this document.

2.1.4 Nonmotorized Placer Mining

Some nonmotorized placer mining also occurs in the main stem SFCR. Some miners move streambed material by hand or shovel and gravity-feed material through a nonmotorized sluice box, pan, or rocker placed within the stream channel. In some cases, this activity occurs within delineated suction dredge reaches by miners with suction dredging permits during the dredge season. In other cases, it is conducted by people without suction dredging authorization or outside the authorized suction dredging season.

Regulating agencies do not require miners to obtain permits for operating nonpowered equipment in the stream channel in most cases. IDAPA 37.03.07.025.05 states that IDWR exempts nonpowered equipment from the general requirement to obtain a Stream Alteration Permit if the surface disturbance is limited to moving 1/4 yd^3/hour or less below the mean high-water mark, disturbs less than 33% of the stream width, and has no more than five people working in the same area. IDWR's rationale is that nonmechanized human-powered tools do not provide the mechanical advantage of processing material at a faster rate. Nonmechanized equipment includes shovels, nonpowered sluice boxes, pans, and rockers. DEQ does not require an IPDES permit for nonpowered placer mining equipment if the operator meets the criteria in IDAPA 37.03.07.025.05 and any BLM or USFS requirements for placer mining on federal land. To DEQ's knowledge USFS and BLM have not required miners to have an approved plan of operations for nonmotorized placer mining activity within the wetted channel of the SFCR or tributaries. DEQ may require permitting in cases of identified water quality impacts, or in the event of new information related to nonpowered equipment. The frequency and extent of nonpowered mining activity in the main stem SFCR has not been documented, and miners are not required to complete logs for this activity. Activity statistics presented in this report are specific to small suction dredge mining operations and do not reflect nonmotorized dredging activity.

2.2 Dredging Activity Statistics

Compiled dredging activity data were used to calculate nine different activity measures for each operation (Table 3). Summary statistics (minimum, maximum, mean, median, 75th percentile) were then calculated for each activity measure across all operations in 2016–2022. Activity data were also used to calculate seven activity measures describing the total industry annual dredging activity across all permitted operations (Table 4). Calculated operation and industry statistics were then compared to applicable requirements (Table 2).

Table 3. Suction dredge activity statistics calculated for each active permitted operation 2016-2022.

Operation Activity Measure	Symbol	Units	Definition
Active hours	$Hours_o$	hours	Operation total active hours during the dredge season reported by USFS and BLM
Active days	$Days_o$	days	Operation total active days during the dredge season reported by USFS and BLM
Hours per day	HPD_o	hours/ day	Operation active hours per day averaged over the season
Total dredge hole area	$Area_o$	ft^2	Operation total dredged streambed area during the dredge season reported by USFS and BLM. Calculated as the sum of reported area across all operation dredge holes.
Dredged area rate	AR_o	ft^2/day	$Area_o$ / $Days_o$
Total dredge hole volume	V_o	yd^3	Operation total dredge volume during the dredge season reported by USFS and BLM. Calculated as the sum of reported volume across all operation dredge holes.
Volumetric excavation rate (VER)	VER_o	yd^3/hour yd^3/day	V_o/ $Hours_o$ V_o / $Days_o$
Excavated mass	EM_o	US tons	V_o x lb/yd^3 x 0.0005 lb/US ton
Excavated load	EL_o	US tons/day	Excavated mass/active days

Table 4. Suction dredge activity statistics calculated on an annual basis for the SFCR suction dredge industry.

Industry Activity Measure	Symbol	Units	Definition
Active hours	$Hours_{industry}$	hours	$\sum_{i=1}^{n} Hours_{o\,i}$
Dredge hole area	$Area_{industry}$	ft^2	$\sum_{i=1}^{n} Area_{o\,i}$
Dredged area rate	$ARi_{industry}$	ft^2/day	$\sum_{i=1}^{n} Area_{o\,i} \Big/ 31\ days$
Dredge hole volume	$V_{industry}$	yd^3	$\sum_{i=1}^{n} V_{o\,i}$
Volumetric excavation rate (VER)	$VER_{industry}$	yd^3/hour	$\sum_{i=1}^{n} V_{o\,i} \Big/ \sum_{i=1}^{n} Hours_{o\,i}$
Excavated mass	$EM_{industry}$	US tons	$\sum_{i=1}^{n} EM_{o\,i}$
Excavated average daily load	$EL_{industry}$	US tons/day	$\sum_{i=1}^{n} EM_{o\,i} \Big/ 31\ days$

2.3 Turbidity

Idaho's water quality standards include numeric turbidity criteria for protecting cold water aquatic life use (IDAPA 58.01.02.250.02.3.e, IDAPA 58.01.02.401.02a). If Tier 1 turbidity data are available, and exceed numeric turbidity criteria, DEQ classifies sediment as impairing cold water aquatic life use. Tier 1 data provide sufficient scientific rigor, relevance, and documentation for use with CWA § 303(d)-list decisions. Tier 1 data must have an established

monitoring plan with defined quality assurance protocols, among other requirements detailed in Idaho's *Water Body Assessment Guidance* (DEQ 2016).

To protect cold water aquatic life, Idaho's water quality standards require that turbidity outside any applicable point source mixing zone does not exceed background turbidity by more the 50 NTU instantaneously or more than 25 NTU for more than 10 consecutive days (IDAPA 58.01.02.250.02.3.e). In addition, a separate turbidity criterion applies to point source discharges (IDAPA 58.01.02.401.02a) and is the basis for suction dredge turbidity requirements established in the SFCR sediment TMDL wasteload allocation (DEQ, EPA, and NPT 2004) and IPDES permit (EPA 2018). In streams where background turbidity ≤ 50 NTU, such as the SFCR, turbidity downstream of a point source (including a suction dredge) must not exceed background (upstream) turbidity by more than 5 NTU outside the point source mixing zone. DEQ defined a 500-foot mixing zone for suction dredges in the SFCR, so to achieve this turbidity criterion, turbidity 500 feet downstream of a dredge operating in the SFCR must be ≤ 5 NTU greater than turbidity upstream of the dredge.

2.3.1 USFS and BLM Turbidity Monitoring

USFS and BLM deployed turbidity sensors upstream and downstream of a few SFCR suction dredge operations each year to evaluate compliance with turbidity requirements established various permit processes (Table 1). USFS and BLM reported turbidity monitoring results in annual suction dredge monitoring reports, which are included in supporting materials at *https://doi.org/10.17605/OSF.IO/3K2NE*.

Available turbidity data collected by USFS and BLM for suction dredge monitoring purposes and described in USFS and BLM annual reports do not qualify as Tier 1 data for several reasons. First, USFS and BLM have not provided documentation of measurement methods, calibration, and quality assurance/quality control information required for Tier 1 data. Second, USFS fisheries biologist staff who conducted turbidity monitoring and other stakeholders advised DEQ that accurately characterizing turbidity patterns downstream of suction dredges requires monitoring staff to be present during discharges and periodically move the downstream turbidity sensor to keep it within the dredge discharge plume as dredging activity moves within a permitted reach, but in past years, staffing limitations prevented this. Third, because the turbidity threshold that must be assessed (≤ 5 NTU over background) is very small and background turbidity in the SFCR is often very low (< 10 NTU), there is a need to demonstrate that turbidity sensors used for measurement can reliably distinguish a 5 NTU increase over background under ambient conditions, or at least quantify a minimum detectable increase. Fourth, it was not always clear to DEQ from available documentation what distance downstream of a dredge turbidity was monitored in each case. For these reasons, DEQ concluded available USFS and BLM turbidity measurement data did not meet data quality requirements and were not compared to applicable TMDL and IPDES permit requirements.

2.3.2 Miner Visual Turbidity Monitoring

The IPDES permit, USFS/BLM POO, and IDWR all require no visible turbidity plume beyond a specified distance downstream from an operating dredge (Table 1). The USFS/BLM POO requires no visible turbidity increase over background levels ≥ 150 feet downstream. The IPDES and IDWR permit require no visible turbidity plume ≥ 500-feet limit at any time.

The IPDES permit requires miners to report the length of the longest turbidity plume visually observed and report any instances of noncompliance and resulting remedy actions in an Annual Report Information Sheet. Field forms miners complete to fulfill POO requirements also include a place for miners to report the maximum turbidity plume length visually observed each day.

Maximum turbidity plume length reported by miners in 2020–2022 IPDES annual reports submitted to DEQ were used to evaluate compliance with visual turbidity requirements. The maximum turbidity plume length reported was compared to the 500-feet requirement from the IPDES permit.

3 Results

3.1 Dredging Locations

During 2016–2022, permitted suction dredging occurred only within the main stem SFCR upstream of Harpster (Figure 2). Nearly all permitted main stem activity occurred upstream of Tenmile Creek. Points in Figure 2 represent the upstream end of dredging reaches delineated for permitted miners by USFS and BLM. Delineated reach lengths reported by USFS and BLM ranged from 39 to 375 feet. Ninety-five of 119 delineated reaches in the compiled dataset (80%) were 150 ft or less.

Dredging activity did not occur in all delineated reaches. In some cases, a miner did not dredge at all or decided not to dredge in the initially delineated reach and asked USFS and BLM to delineate a different reach within their claim before operating.

Dredging location restrictions vary across permitting agencies (Table 1). All agencies allow for dredging in the main stem upstream of Harpster but what is allowed in other main stem segments or tributaries differs across agencies (Table 1). To DEQ's knowledge, no agencies issued permits for tributary dredging during 2016–2022. USFS reported unauthorized dredging operations occurred in tributaries during the 2018 and 2020 seasons (section 3.2). There were no other reports of unauthorized dredging outside permitted areas of the main stem in information provided by agencies.

3.2 Number of Active Dredging Operations

3.2.1 Permitted Suction Dredge Operations

Each year there were 10–13 active permitted operations in the river (Table 5). An active permitted operation has the required permits *and* operated. Agencies reported at least two permittees did not operate each year.

3.2.2 Unauthorized Suction Dredge Operations

USFS reported unauthorized dredging occurred in 2018 in both the main stem SFCR and in tributaries. In its 2018 annual report, USFS reported seven unauthorized dredging operations on the main stem SFCR, two unauthorized operations in Red River, and one unauthorized operation in Siegel Creek, a tributary to Red River. The report stated all known unauthorized miners were members of American Miners Rights Association and dredged while openly defying permitting requirements. The matter was referred to USFS and EPA law enforcement. The USFS 2018 annual report includes a table with information provided by the Tenmile Mining District documenting unauthorized mining activity during the 2018 season. The 2018 USFS report stated unauthorized operations dredged a total of 244.55 yd^3 across 36 different dredging sites.

USFS also reported unauthorized suction dredging occurred in 2020 in Horse Creek, a tributary of Red River. The USFS annual report stated “no contact was made with the operator and the suction dredge activity ceased shortly after Forest personnel noted activity was taking place. The dredged area was reclaimed, and the operator to date has not been identified” (McKeag et. al. 2021).

In general, the frequency and extent of unauthorized tributary dredging is not known. Agency staff sometimes receive reports of tributary dredging but are unable to confirm them and take compliance or enforcement action. For example, USFS staff stated they received four reports of unauthorized dredging in the Crooked River drainage in 2018, but USFS could not confirm the reports and took no enforcement or compliance actions (Katie Rhode, USFS, personal communication, November 3, 2023). USFS annual reports also stated USFS focused compliance monitoring efforts on the main stem SFCR due to limited resources. DEQ, BLM, and IDWR have also focused compliance monitoring efforts primarily on the main stem. Unauthorized dredging activity is not included in Table 5 or Table 6. A summary of USFS compliance and enforcement actions is included in Appendix A.

In 2018, the Idaho Conservation League (ICL) sued Shannon Poe for operating a suction dredge in the SFCR without a permit on 42 occasions across 2014, 2015, and 2018 (Idaho Conservation League v Poe 2018). In 2021, US Magistrate Judge Ronald E. Bush of the US District Court of Idaho issued a summary judgement in ICL’s favor (Idaho Conservation League v Poe 2021). The judgement concluded processed material discharged from suction dredge qualifies as a pollutant under the CWA, requires an IPDES permit under CWA § 402, and is not dredged material requiring a permit from the US Army Corps of Engineers under CWA § 404 (Idaho Conservation League v Poe 2021). The judgment also concluded Mr. Poe’s dredging activities added pollutants to the SFCR and required an IPDES permit (Idaho Conservation League v Poe

2021). In a subsequent ruling, the US District Court of Idaho ordered Mr. Poe to pay a $150,000 fine and issued an injunction barring Mr. Poe from suction dredge mining in the SFCR unless he obtains and complies with an IPDES permit.

3.3 Activity Statistics

Industry-level activity measure statistics are presented in Table 5. Operation-level activity measure summary statistics are presented in Table 6 and Figure 3–Figure 6.

Table 5. Industry annual suction dredging activity statistics.[a]

Year	Active Operations			$Hours_{industry}$ (hours)	$Area_{industry}$ (ft^2)	$V_{industry}$ (yd^3)	$EM_{industry}$ (US tons)	$VER_{industry}$ (yd^3/hour)	$EL_{industry}$ (US tons/day)
	USFS	BLM	Total						
2016	9	1	10	581	2,796	—	—	—	—
2017	9	1	10	937	3,883	—	—	—	—
2018	11	0	11	392	1,002	—	—	—	—
2019	11	2	13	1,017	2,921	231	301	0.2	9.8
2020	10	2	12	1,358	3,687	282	369	0.2	11.9
2021	7	3	10	778	4,171	489	639	0.6	20.6
2022	8	3	11	947	1,662	236	308	0.3	9.9

a. See Table 4 for statistic definitions. '—' indicates insufficient data were available for the calculation.

Table 6. Suction dredge operation activity statistics, calculated across all active operations with necessary data 2016-2022.[a]

Operation Activity Statistic	Units	N	Min	Max	Mean	Median	75th percentile
Active hours ($Hours_o$)	hours	76	2.0	260	79.1	57.4	120
Active days ($Days_o$)	days	77	1	31	16.2	16	21.3
Hours per day (HPD_o)	hours/day	76	0.5	15	4.8	4.8	6.0
Total dredge hole area ($Area_o$)	ft^2	76	3	1,142	265	234	325
Dredged area rate (AR_o)	ft^2/day	76	1	46	16.0	13.0	21.3
Total dredge hole volume (V_o)	yd^3	47	1.1	100	26.9	18.7	37.8
Volumetric excavation rate (VER_o)	yd^3/day	47	0.2	6.1	1.4	0.9	1.9
	yd^3/hour	46	0.03	1.5	0.3	0.2	0.4
Excavated mass (EM_o)	US tons	47	1.5	130.9	35.2	24.4	49.3
Excavated load (EL_o)	US tons/day	47	0.1	7.9	1.8	1.2	2.5

a. See Table 3 for statistic definitions. N = number of operations with data needed to calculate summary statistics.

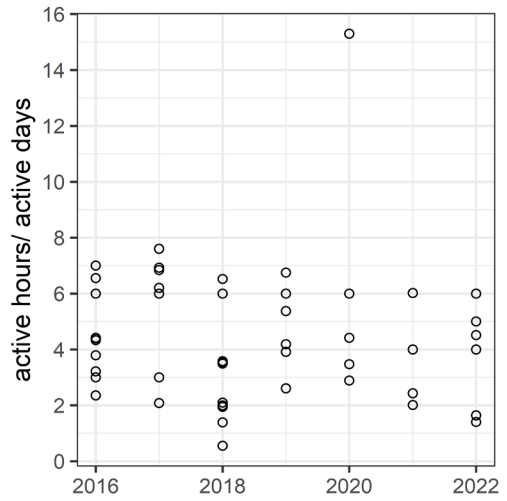


Figure 3. Calculated active hours per day for each permitted active dredge operation.

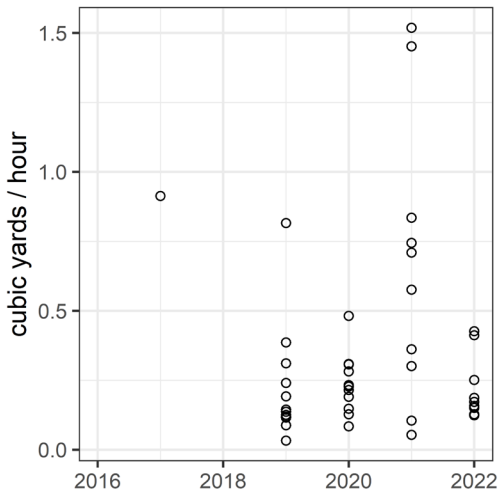


Figure 4. Calculated hourly operation volumetric excavation rates for each permitted active dredge operation.

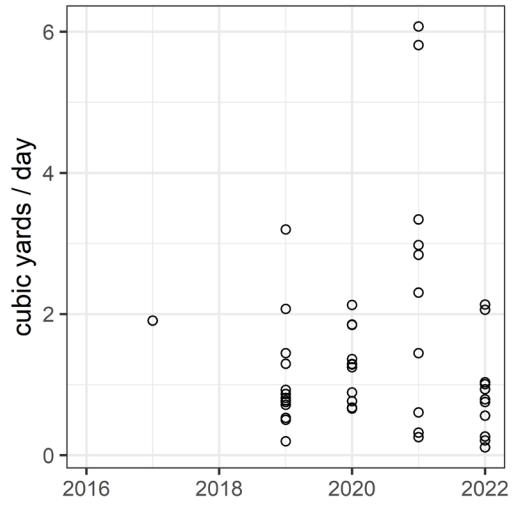


Figure 5. Calculated daily operation volumetric excavation rates for each permitted active dredge operation.

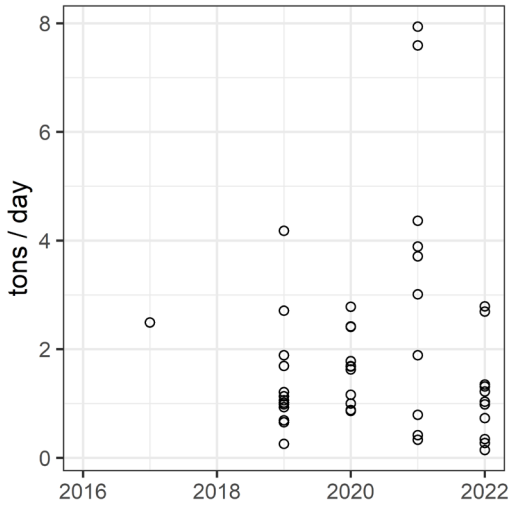


Figure 6. Calculated daily operation excavated material load for each permitted active dredge operation.

Operation active hours per day ranged from 0.5 to 15 (average = 4.8 hours/day, median = 4.8 hours/day, 75th percentile = 6 hours/day) (Figure 3). One operation in 2020 had a calculated average of 15.3 hours per day (USFS reported 260 active hours over 17 days). In response to a draft version of this report, USFS staff stated this total active hours number is likely a reporting error, but did not provide a corrected value. The value was retained in the analysis, but its accuracy is not known.

Note that the operation and industry dredge hole area is a subset of total streambed area disturbed by dredging activity. Total disturbed area includes both dredge hole area and any downstream streambed area altered by suction dredge discharges. Data for downstream altered area were not provided, and to DEQ's knowledge, the downstream altered area has not been measured.

Dredge hole volume represents the total volume of streambed material excavated by an operation, including both material moved by hand and processed through a dredge. Dredge hole volume is almost always greater than volume of material dredging activity causes to move downstream. Some excavated material is taken up by the ≤ 5-inch diameter dredge intake nozzle and subsequently discharged downstream by the dredge as dredge effluent. Miners also move other larger streambed material that cannot be taken up by a dredge nozzle by hand and subsequently backfill that material into a dredge hole. Some backfilled material may be more likely to move downstream during spring high flows than undisturbed streambed material, although this is not fully clear because the relative stability of disturbed and undisturbed material was not measured. Only a fraction of the total excavated material is discharged downstream due to dredging activities. The fraction of excavated material that SFCR dredging activities caused to move downstream has not been measured.

Similarly, calculated operation and industry volumetric excavation rates include both streambed material miners move by hand and streambed material taken up by a dredge intake nozzle. $VER_{operation}$ will always be greater than the dredge intake material volumetric rates if a miner also moves material by hand. $VER_{operation}$ and $VER_{industry}$ are almost always greater than the volumetric rate of material moved downstream as effluent or other processes by dredging activity for the reasons described above. Also, excavated material mass is almost always larger than the mass dredging activity that causes material to move downstream.

The industry average daily excavated load (US tons/day) was estimated for each year by dividing the total annual industry excavated mass by the number of days (i.e., 31) in the dredging season. On any individual day, the actual daily load may be lower or higher, depending on the number of active dredges and the volume processed by each dredge. Actual daily excavation rates could not be calculated because USFS and BLM provided the total dredge hole volume for each operation but not the dredged volume per day for each operation.

Excavated loads calculated here represent the total mass of excavated streambed material disturbed by dredging activity. As discussed above, the load moved downstream by dredging activity as either dredge effluent or other disturbed material will almost always be smaller. The proportion of excavated material that moved downstream has not been measured.

3.4 Turbidity

Maximum turbidity plume length reported by miners in the 2020–2022 IPDES permit miner annual reports ranged from 20 to 200 feet (N = 16, mean = 78 feet) and did not exceed the 500-foot threshold. Maximum turbidity plume length information was not available for all active dredge operations in 2020–2022.

4 Comparison of Suction Dredge Activity Measures to Applicable Requirements

4.1 Location

Dredging location restrictions vary across permitting agencies (Table 1). All agencies allow for dredging in the main stem upstream of Harpster, but restrictions for other main stem segments and tributaries differs across permits (Table 1).

For this analysis, dredging locations were compared to IPDES permit requirements, which restrict dredging to the main stem upstream of Harpster (Table 1). The IPDES permit would only allow dredging in tributaries for cases where a miner has an approved IDWR/IPDES joint permit and documentation of ESA section 7 compliance for proposed activities (EPA 2018). All permitted dredging met IPDES permit location requirements, but unauthorized dredging also occurred in 2018 and 2020.

4.2 Timing

All permit processes restrict suction dredging in the SFCR watershed to July 15–August 15 (Table 1). All permitted dredging occurred within the July 15–August 15 dredging season, consistent with permit requirements. It was not clear from USFS documentation whether unauthorized dredging activity also occurred during the July 15–August 15 period.

4.3 Number of Operations

The number of permitted suction dredging operations varies across permits (Table 1). For this analysis, the number of active operations was compared to the IPDES permit requirement for a maximum of 15 operations. There were ≤ 15 active permitted operations each year, consistent with permit requirements (Table 2). However, unauthorized suction dredging also occurred in 2018 and 2020.

4.4 Active Hours

The number of active dredging hours per day allowed varies across permits (Table 1). For this analysis, the calculated operation average active hours per day (section 3.3) was compared to the 8 hours/day maximum established by the IPDES permit. The operation active hours per day

ranged from 0.5 to 15 (average = 4.8 hours/day, median = 4.8 hours/day, 75th percentile = 6 hours/day) (Figure 2). One operation in 2020 exceeded the 8 hours/day limit, but the total active hours reported for this operation from USFS is likely an error. DEQ assumed all permitted dredging operations complied with the IPDES permit 8 hours/day requirement. For 2018 unpermitted operations, USFS reported activity ranged from 3 to 8.5 hours/day, based on information provided by the Tenmile Mining District (Kenney et al. 2019).

4.5 Operation Volumetric Excavation Rates

The IPDES permit effluent limits for SFCR suction dredges states permittees "are limited to processing an average of 2 yd^3/hour over the period of an 8-hour day" (EPA 2018). For this analysis, DEQ assumed the IPDES permit 2 yd^3/hour processing rate requirement applies to all excavated material, including both material miners move by hand and material taken up into a dredge through a dredge intake nozzle. Whether EPA intended processed material to mean all excavated material or only material processed through a dredge is not fully clear. Calculated $VER_{operation}$ includes all excavated material. Calculated hourly $VER_{operation}$ ranged from 0.03 to 1.51 yd^3/h (average = 0.3 yd^3/h, median = 0.2 yd^3/h, 75th percentile = 0.4 yd^3/h) (Table 6 and Figure 4). All permitted operations met the 2 yd^3/hour requirement.

Assuming the IPDES permit 2 yd^3/hour processing rate applies only to suction dredge effluent, then operations are also in compliance with IPDES permit requirements. Calculated hourly $VER_{operation}$ includes both material miners moved by hand and material taken up through a suction dredge nozzle and is still < 2 yd^3/hour. Suction dredge influent and effluent volume rates have not been measured in the SFCR watershed or elsewhere in Idaho to DEQ's knowledge.

IDWR previously reviewed suction dredge material processing rates reported by suction dredge manufacturers based on field testing for 4–5-inch diameter nozzle dredges ranged from 0.46 to 1.37 yd^3/hour (IDWR 2017). These manufacturer estimates presumably are based on suction dredge intake material rather than processed material but overlap with $VER_{operation}$ values calculated here (Figure 4).

4.6 Industry Daily Discharge Load

The TMDL wasteload allocation includes a 314 tons/day maximum industry daily load for the SFCR (DEQ, EPA, and NPT 2004). For this analysis, DEQ assumed the TMDL wasteload allocation was intended to be a limit for suction dredge effluent (Box 1—Definitions).

In describing the basis for TMDL wasteload allocation, the TMDL stated the "daily volume of sediment processed by these existing operations therefore appears to be a reasonable surrogate measure to prevent increased bedload movement and surface fine sediment downstream of suction dredges" (DEQ, EPA, and NPT 2004). The TMDL does not explicitly define whether *sediment processed* includes only suction dredge effluent, or also material miners move by hand and never processed through a dredge.

Evidence suggests the original intent was likely to define a daily load limit only for suction dredge effluent. The TMDL load limit was calculated assuming operations processed 2 yd^3/hour. The 2 yd^3/hour rate assumption was based on an IDWR suction general permit condition in place at the time the TMDL was developed (IDWR 2017). IDWR indicated the 2 yd^3/hour rate in the general permit was "likely based on past general published suction dredge industry specifications for small scale dredges not exceeding a 5-inch suction nozzle diameter" and is consistent with manufacturer estimates for the upper capacity of material a dredge with a 5-inch nozzle can process under ideal conditions (IDWR 2017). The manufacture estimates and 2 yd^3/hour assumption likely represented only the rate of material moving through a suction dredge.

In addition, TMDL wasteload allocations define the maximum daily load of material a point source can *discharge* while still meeting state water quality standards. For a suction dredge, this would likely only include the material discharged from the dredge effluent conveyance. IPDES permits are also developed to define limitations for point source *discharge effluent*. The IPDES permit explicitly states the permit "does not cover anything other than the discharge of wastewater from the suction dredge" (EPA 2018). Therefore, it seems reasonable to assume the TMDL wasteload allocation (314 tons/day) and IPDES permit processing rate (2 yd^3/day) were intended to be specific to dredge effluent and not include material miners move by hand that is not processed through a dredge.

The industry average daily excavated load (Table 4, Table 5) is the only data available for comparison to the TMDL wasteload allocation. Excavated loads were calculated based on suction dredge hole volume measurements. When a miner moves some streambed material by hand that never passes through a suction dredge, the hole volume and excavated load will be larger than the influent and effluent load. To DEQ's knowledge, the fraction of operation excavated volume (hand moved + dredge influent) that is taken up into a suction dredge nozzle and discharged downstream as effluent was not quantified in the SFCR or elsewhere.

Comparing the 314 tons/day TMDL wasteload allocation to the *excavated* material load is a conservative (protective) approach to evaluating TMDL wasteload allocation compliance. If the tons per day of *excavated* (hand-moved plus dredge intake) material meets the 314 tons/day requirement, then load requirements based on dredge effluent will also be met because only a fraction of excavated material is taken up by the dredge or moved downstream. The fraction of excavated material that is discharged as suction dredge effluent was not measured in the SFCR or elsewhere in Idaho to DEQ's knowledge.

Total industry average daily excavated loads were calculated for 2019–2022 and ranged from 9.8 to 20.6 tons/day (Table 5). Because the industry excavated load was less than the 314 tons/day wasteload allocation, DEQ concluded the industry discharge load also complied with the wasteload allocation.

4.7 Industry Seasonal Discharge Load

An industrywide seasonal maximum discharge load (9,734 tons/season) can be calculated by multiplying the wasteload allocation (314 tons/day) by the length of the dredging season (31 days). The industry annual excavated material (hand-moved plus dredge intake) mass (section 4.6) ranged from 301 to 638 tons/season and was less than one-tenth the industry seasonal maximum discharge load.

4.8 Turbidity

Turbidity impacts could not be assessed using turbidity measurement data for reasons described in section 2.3. Maximum turbidity plume lengths reported by miners in 2020–2022 IPDES permit miner annual reports ranged from 20 to 200 feet and did not exceed the 500-foot threshold. Maximum turbidity plume length information was not available for all active dredge operations in 2020–2022.

Table 7. Summary of comparison of permitted suction dredge activity measures to applicable requirements.

	Measure	Requirement	Source	Outcome
1	Location	Main stem upstream of Harpster; dredging in tributaries requires approved IDWR/IPDES joint permit and ESA section 7 compliance	NPDES Permit IDG37000	Unauthorized tributary dredging in 2018 and 2020; otherwise, requirement met
2	Timing	Dredging July 15–-August 15 only	NPDES Permit IDG37000, TMDL	Requirement met
3	Number of operations	≤ 15 active operations/year	NPDES Permit IDG37000	Limit exceeded in 2018 due to unauthorized dredging; otherwise, requirement met
4	Active hours per day	≤ 8 hours/day activity per operation	NPDES Permit IDG37000	Requirement met for permitted operations, exceeded by 2018 unauthorized operations
5	Material processing rate [a]	≤ 2 yd^3/hour material processed per operation	NPDES Permit IDG37000	Requirement met
6	Industry daily dredge effluent load	≤ 314 tons/day industry annual dredge effluent load	TMDL wasteload allocation	Requirement met. Industry daily excavated loads meet effluent load requirement (Table 5)
7	Industry seasonal dredge effluent load	≤ 9,734 tons/season (314 tons/day x 31 days)	Calculated based on TMDL wasteload allocation	Requirement met
8	Turbidity impacts	Turbidity ≤ 5 NTU over background and no visible turbidity plume ≥ 500 feet downstream of dredges	NPDES Permit IDG37000, TMDL wasteload allocation, DEQ 401 certification of EPA's NPDES permit	Insufficient turbidity measurement data; visual plume length requirement met

a: the 2018 NPDES/IPDES permit states "permitees are limited to processing an average of 2 yd^3/hour over the period of an 8-hour day", but did not define 'processing'. This requirement was assumed to apply to dredge effluent because the permit states "The NPDES GP does not cover anything other than the discharge of wastewater from the suction dredge".

5 Relationship Between Suction Dredge Activity Measures and Ecological Effects

In the SFCR watershed, an empirical relationship between suction dredge activity magnitude and either presence/absence or magnitude of effects on macroinvertebrates, fish, or other aquatic life has not been developed. The SFCR sediment TMDL explicitly stated there was limited information about suction dredging effects in the SFCR watershed:

> Given the lack of consistent monitoring of the effects of this industry in the SF CWR watershed, it is recommended that the USFS, DEQ and USEPA establish a monitoring plan to further characterize and assess these impacts on an ongoing basis (DEQ, EPA, and NPT 2004).

Ongoing monitoring by government agencies includes measurements of dredging activity (number of dredges, dredging time, and dredged area and volume) and sporadic turbidity monitoring (section 2.3). Habitat quality and biological parameters were not a standard part of the 2016–2022 annual permit monitoring programs.

However, some habitat quality and biological monitoring was conducted. Stream substrate fine sediment was measured before and after dredging for a handful of dredged reaches. In 2016, USFS and BLM collected Wolman Pebble counts from three transects within several dredged reaches. In 2001, DEQ also measured fine sediment using Wolman Pebble counts in transects upstream and downstream and before and after dredging for two dredging operations. Associated results for measured % sand and fines (measured as % particles < 2 millimeter (mm) by USFS and BLM, < 2.5 mm by DEQ) are presented in Table 8. Because sample design differences across these two studies and because data are only available for nine dredged reaches, these data are not sufficient to draw definitive conclusions about the presence/absence or magnitude of dredging activity impacts on surface fine sediment.

Some limited stream channel profile, macroinvertebrate, and redd survey data are also available. In 2016, USFS and BLM measured stream longitudinal profiles within delineated dredging reaches before and after dredging operations (Kenney 2016, Johnson 2016). BLM also conducted a Chinook salmon redd survey within a dredged reach in 2016 (Johnson 2016). In July 2020, BLM's national Assessment Inventory and Monitoring (AIM) program monitored a SFCR main stem reach slightly downstream of Whiskey Creek. AIM monitoring included substrate percent fines, multiple measures of stream physical condition and geomorphology, and macroinvertebrate sample collection. In 1999, DEQ monitored surface fine sediment and macroinvertebrates above and below and before and after dredging for several dredging operations (DEQ 2003). These monitoring data are not sufficient to rigorously or statistically evaluate the presence or absence of dredging effects on measured parameters or establish an empirical relationship between dredge activity magnitude and parameter response.

Drone flights were also used to document stream changes in dredged reaches. In 2018, an IDWR contractor used drone surveys to document and measure streambed disturbances in dredged reaches within the main stem SFCR (Biomark 2018). Drone flights were conducted in

October 2018 after the dredging season was over. Photos taken in each reach from multiple altitudes were used to develop orthomosaic photos and develop a 3-dimensional digital elevation model of the streambed within dredged reaches. Drone flights documented and described features present in dredged reaches, including areas of fine sediment and tailings areas and filled and unfilled dredge holes.

BLM also hired a contractor to conduct pre- and postdredging flights for two permitted dredging operations in 2018 (Johnson 2018). The contractor conducted predredging flights on July 17, 2018, and developed orthomosaic photos and digital elevation models for each delineated dredging reach. However, no dredging activity occurred in these two reaches so no postdredging drone flights were conducted.

Table 8. Stream substrate percent fines measurements for dredged reaches.

Reach Name	Area	Description	Year	Active Reach	Predredging (%)	Postdredging (%)	Source
Baraglia	SFCR	75-foot dredge reach with upstream UTM coordinates 5076079 N, 610373 E	2016	Y	3	5	Kenney 2016
Hoskins	SFCR	150-foot dredge reach with upstream UTM coordinates 5073067 N, 601419 E	2016	Y	26	36	Kenney 2016
Layman	SFCR	150-foot dredge reach with upstream UTM coordinates 5075236 N, 617358 E	2016	Y	15.2	17.7	Johnson 2016
Hendren	SFCR	150-foot dredge reach with upstream UTM coordinates 5075881 N, 616075 E	2016	N	14.1	No data	Johnson 2016
Upper site, above dredge	SFCR	Below American and Red Rivers	2001	Y	26	32	DEQ 2003
Upper site, 101 meters below dredge	SFCR	Below American and Red Rivers	2001	Y	No data	10	DEQ 2003
Lower site, above dredge	SFCR	Above Johns Creek	2001	Y	6	10	DEQ 2003
Lower site, 40 meters below dredge	SFCR	Above Johns Creek	2001	Y	No data	46	DEQ 2003
Lower site, 115 meters below dredge	SFCR	Above Johns Creek	2001	Y	3	20	DEQ 2003
Whitcomb	Moose	100-foot dredge reach with upstream UTM coordinates 5180019 N, 646361 E	2016	Y	10	7	Kenney 2016
Dill/Bowling	Orogrande	100-foot dredge reach with upstream UTM coordinates 5159252 N, 605840 E	2016	Y	10.1	16	Kenney 2016
Schneider	Lolo	150-foot dredge reach with upstream UTM coordinates 5138456 N, 600523 E	2016	Y	11	9	Kenney 2016

Note: Universal Transverse Mercator coordinates

Harvey and Lisle (1998) reviewed scientific literature on the effects of suction dredge mining on streams and reported that effects can be watershed specific and highly variable, depending on stream geology and physical characteristics, dredging practices, and aquatic life-types present. Documented dredging effects range from positive short-term effects on fish habitat (creation of temporary low-velocity microhabitats in dredge holes) to drastic stream channel and habitat changes and fish injury or mortality through dredge entrainment.

Considering the purpose of the suction dredging wasteload allocation in the sediment TMDL, the IPDES permit and certain conditions in the IDWR and POO permits are to mitigate or prevent adverse effects of suction dredging on aquatic life, monitoring should be designed to quantify the relationship between suction dredge activity magnitude and either presence or absence or magnitude of effects. Without such monitoring, it will be difficult to evaluate whether existing regulations achieve intended goals or need to be modified.

6 Data Availability

Compiled datasets and R code used for analyses are available at *https://doi.org/10.17605/OSF.IO/3K2NE*. Government reports cited in this document and draft report comment letters are also available through this link.

7 References

Biomark Applied Biological Services. 2018. Post Season Dredge Monitoring: South Fork Clearwater River and Red River, Idaho. Prepared by Richie Carmichael for Idaho Department of Water Resources. Boise, ID. December 31, 2018.

DEQ (Idaho Department of Environmental Quality). 2003. *Water Quality Summary Report 34. A Recreational Suction Dredge mining Water Quality Study on South Fork Clearwater River*. Lewiston, ID: DEQ.

DEQ (Idaho Department of Environmental Quality). 2016. *Water Body Assessment Guidance*, 3rd edition. Boise, ID: DEQ. *https://www2.deq.idaho.gov/admin/LEIA/api/document/download/14844*

DEQ (Idaho Department of Environmental Quality). 2022. *Suspended Sediment Patterns in the South Fork Clearwater River and Selected Tributaries (2021)*. Lewiston, ID: DEQ. *https://www2.deq.idaho.gov/admin/LEIA/api/document/download/18536*

DEQ, EPA, and NPT (Idaho Department of Environmental Quality, US Environmental Protection Agency, and Nez Perce Tribe). 2004. *South Fork Clearwater River Subbasin Assessment and Total Maximum Daily Loads.* Lewiston, ID: DEQ. pp. 218–220. *https://www2.deq.idaho.gov/admin/LEIA/api/document/download/11780*

EPA (US Environmental Protection Agency). 2018. *Authorization to Discharge Under the National Pollutant Discharge Elimination System (NPDES) for Small Suction Dredge Miners in Idaho*. General Permit No. IDG370000. Permit effective date June 1, 2018. pp. 5, 18.

Harvey, B.C. and T.E. Lisle. 1998. "Effects of Suction Dredging on Streams: a Review and an Evaluation Strategy." *Fisheries*. 23(8): 8–17. *https://doi.org/10.1577/1548-8446(1998)023%3C0008:EOSDOS%3E2.0.CO;2*

Idaho Conservation League v Poe. 2018. *https://advocateswest.org/wp-content/uploads/2018/08/Poe-CWA-Dkt-1-Complaint-2018-08-10.pdf*

Idaho Conservation League v Poe. 2021. *https://www.govinfo.gov/content/pkg/USCOURTS-idd-1_18-cv-00353/pdf/USCOURTS-idd-1_18-cv-00353-1.pdf*

IDWR (Idaho Department of Water Resources). 2017. Review of the 15 Special Supplement Permit Limit for Small Scale Suction Dredge Mining on the South Fork Clearwater River. Memo from Tim Luke to Roger Chase and Mat Weaver dated November 16, 2017.

IDWR (Idaho Department of Water Resources). 2023. 2023 IDWR South Fork Clearwater River Special Supplement Instructions Form. *https://idwr.idaho.gov/wp-content/uploads/sites/2/stream-channel/2023-IDWR-SFCR-Special-Supplement.pdf*

Johnson, C. 2016. *Bureau of Land Management 2016 Suction Dredging Monitoring Report for the South Fork Clearwater River*. BLM Cottonwood Field Office.

Johnson, C. 2017. *Bureau of Land Management 2017 Suction Dredging Monitoring Report for the South Fork Clearwater River*. BLM Cottonwood Field Office.

Johnson, C. 2018. *Bureau of Land Management 2018 Suction Dredging Monitoring Report for the South Fork Clearwater River. BLM Cottonwood Field Office*.

Johnson, C. 2020. *Bureau of Land Management 2019 Suction Dredging Monitoring Report for the South Fork Clearwater River*. BLM Cottonwood Field Office.

Johnson, C. 2021. *Bureau of Land Management 2020 Suction Dredging Monitoring Report for the South Fork Clearwater River*. BLM Cottonwood Field Office.

Johnson, C. 2022. *Bureau of Land Management 2021 Suction Dredging Monitoring Report for the South Fork Clearwater River.* BLM Cottonwood Field Office.

Kenney, D. 2016. *Post-Season Suction Dredging Report for the South Fork Clearwater River, and Moose, Lolo, and Orogrande Creek Project Areas*. Nez Perce-Clearwater National Forest.

Kenney, D. and D. Donnelly. 2018. *Post-Season Suction Dredging Report for the South Fork Clearwater River, and Moose, Lolo, and Orogrande Creek Project Areas*. Nez Perce-Clearwater National Forest.

Kenney, D., C. Caton, and D. Bawdon. 2019. *2018 Post-Season Suction Dredging Report for the South Fork Clearwater River, Moose, Lolo, and Orogrande Creek Project Areas on the Nez Perce-Clearwater National Forests.* Nez Perce-Clearwater National Forest.

Kenney, D., H. Lewison, and S. Hampton. 2020. *2019 Post-Season Suction Dredging Report for the South Fork Clearwater River, Moose, Orogrande, French, and Lolo Creek Project Areas on the Nez Perce-Clearwater National Forests*. Nez Perce-Clearwater National Forest.

NOAA (National Oceanic and Atmospheric Administration). 2016. *Endangered Species Act Section 7(a)(2) Biological Opinion, and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the South Fork Clearwater River Suction Dredging Program, Idaho County, Idaho*.

McKeag, G., H. Lewis., and S. Hampton. 2021. *2020 Post-Season Suction Dredging Report for The South Fork Clearwater River, Moose, Orogrande, French, and Lolo Creek Project Areas on the Nez Perce-Clearwater National Forests*. Nez Perce-Clearwater National Forest.

McKeag, G., H. Lewis, and D. Bawdon. 2022. *2021 Post-Season Suction Dredging Report for the South Fork Clearwater River, Moose, Orogrande, French, and Lolo Creek Project Areas on the Nez Perce-Clearwater National Forests*. Nez Perce-Clearwater National Forest.

USFS (US Forest Service) 2023a. South Fork of the Clearwater River Suction Dredging USFS Forms. *https://www.fs.usda.gov/detail/nezperceclearwater/landmanagement/resourcemanagement/?cid=fseprd570931*

USFS (US Forest Service). 2023b. *Design Criteria and Mitigation Measures for Suction Dredging Operations*. *https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd533916.pdf*

USFS (US Forest Service). 2023c. Nez Perce-Clearwater National Forests Small Scale Suction Dredging, Additional Information Form, South Fork Clearwater River. *https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd609243.pdf*

USFS and BLM (US Forest Service and Bureau of Land Management). 2016. *Environmental Assessment: Small-Scale Suction Dredging in Orogrande and French Creeks and South Fork Clearwater River*.

Appendix A. USFS Summary of Compliance/Enforcement Actions Taken

This appendix contains a summary of compliance and enforcement actions taken by the US Forest Service. The Nez Perce-Clearwater National Forest provided this information to the Idaho Department of Environmental Quality in comments on a draft version of the report and requested the information be included in the report.

South Fork Clearwater River Suction Dredging—Summary of Compliance/Enforcement Actions Taken

During the years 2015 and 2018, a number of compliance/enforcement actions were taken as a result of unauthorized dredging on the South Fork Clearwater River. Nineteen of these actions have been documented on a spreadsheet accompanying this summary, but by no means reflects the total number of actions taken, as the electronic records I have available appears to be replete with a number of noncompliance notices served by then Forest Geologist Clint Hughes on or about 2015.

It must be noted that unauthorized dredging activities were noted on streams tributary to the South Fork Clearwater River. These were dealt with separately and on a case by case basis and are not discussed here.

The compliance actions I note here are:

- Two Notices of Noncompliance issued by the Forest Service for operation without an approved Plan of Operations in 2015
- One Notice of Noncompliance issued by the Forest Service in 2016 for operating outside the delineated reach
- Nine initial Notices of Noncompliance issued by the Forest Service for operation without an approved Plan of Operations in 2018
- Five follow up Notices of Noncompliance issued by the Forest Service for continued operation without an approved Plan of Operations in 2018

Enforcement actions taken were:

- Shannon Poe sued by ICL 9/28/22for dredging in SFCR without an NPDES, fined $150,000
- David Erlanson sued by EPA and fined $6600 for dredging in SFCR without an NPDES

Since the 2018 suction dredging season, no compliance or enforcement actions have been required for any dredgers on the South Fork Clearwater River, with only minor compliance issues occurring which were relatively easily resolved between the Forest Service and the dredgers. I attribute this to the earlier efforts taken to educate suction dredgers on the permitting requirements and to the decisive action taken to reinforce those efforts as needed.

One footnote: The DEQ's note on page 14, paragraph 1 notes that one dredger exceeded the allowable eight hours/day established by the IPDES permit. This is most certainly a reporting error as DEQ implies or is simply an error in calculation or carrying numbers over from data sheets.

In addition, a number of citations were issues for suction dredging violations on the South Fork Clearwater River. Specific information on the disposition of these citations is not currently available.

	South Fork Clearwater River Suction Dredging Compliance Actions	
Date	**Claimant**	**Action**
7/26/2018	Carlson	Nicole Carlson served Notice of Noncompliance for dredging without an approved Plan of Operations
10/7/2020	Erlanson	David Erlanson sued by EPA and fined $6600 for dredging in SFCR without an NPDES
7/18/2018	Grissom	David Hembree served Notice of Noncompliance for dredging without an approved Plan of Operations
7/24/2018	Grissom	Carl Grissom served second Notice of Noncompliance for dredging without an approved Plan of Operations
7/15/2016	Grossnicklaus	Van Grossnicklaus served Notice of Noncompliance for dredging outside delineated reach
7/18/2018	Hembree	David Hembree served Notice of Noncompliance for dredging without an approved Plan of Operations
8/10/2018	Hembree	David Hembree served second Notice of Noncompliance for dredging without an approved Plan of Operations
7/18/2018	Johnson	Jack Johnson served Notice of Noncompliance for dredging without an approved Plan of Operations
7/24/2018	Johnson	Jack Johnson served second Notice of Noncompliance for dredging without an approved Plan of Operations
7/18/2018	Miller	Ron Miller served Notice of Noncompliance for dredging without an approved Plan of Operations
7/18/2018	Poe	Shannon Poe served Notice of Noncompliance for dredging without an approved Plan of Operations
7/24/2018	Poe	Shannon Poe served second Notice of Noncompliance for dredging without an approved Plan of Operations
9/28/2022	Poe	Shannon Poe sued by ICL for dredging in SFCR without an NPDES, fined $150,000
7/18/2018	Schroeter	Charles Schroeter served Notice of Noncompliance for dredging without an approved Plan of Operations
7/24/2018	Schroeter	Charles Schroeter served second Notice of Noncompliance for dredging without an approved Plan of Operations
7/24/2018	Sherriffs	William Sherrifs served Notice of Noncompliance for dredging without an approved Plan of Operations
7/18/2018	Stickley	John Stickley served Notice of Noncompliance for dredging without an approved Plan of Operations
7/22/2015	Erlanson	David Erlanson served Notice of Noncompliance for dredging without an approved Plan of Operations
7/22/2015	Rice	R. J. Rice served Notice of Noncompliance for dredging without an approved Plan of Operations