Project I

Non-native Invasive Species Monitoring and Research

FY 2025

Triennial Work Plan Budget

Project Element	Description	Salaries	Travel & Training	Operating Expenses	Logistics Expenses	Cooperative Agreements	To other USGS Centers	Burden	Total
I.1	System-wide native fishes and invasive aquatic species monitoring	$8,661	$0	$4,650	$158,339	$258,500	$0	$45,175	$475,325
I.2	Estimating kinship and spawner abundance of warm-water non-natives	$84,646	$0	$1,000	$0	$117,500	$0	$22,196	$225,342
I.3	Identifying emerging threats to the Colorado River Ecosystem using environmental DNA	$91,325	$5,100	$18,700	$32,011	$270,108	$0	$40,179	$457,422
I.4	Modeling population dynamics and improving forecasting tools for smallmouth bass and other non-native fish	$178,651	$1,000	$2,050	$0	$0	$0	$39,611	$221,312
Total		**$363,284**	**$6,100**	**$26,400**	**$190,350**	**$646,108**	**$0**	**$147,160**	**$1,379,402**

Compliance, Triggers, Goals

Needed for Compliance?	Needed for Exp Trigger?	Needed for Exp Action Analysis or Monitoring?	LTEMP Resource Goal	Nonnative Inv Species Metric
Yes (BO, LTEMP ROD)	No	Yes	#10	Yes
Yes (LTEMP sEIS)	No	Yes	#10	Maybe?
Yes (BO, LTEMP ROD)	No	Yes	#10	Yes
Yes (LTEMP sEIS)	No	Yes	#10	Yes

This project also addresses the NNF Strategic Plan

Experimental Fund Budget

LTEMP Flow Experiments									
Project Element	**Description**	**Salaries**	**Travel & Training**	**Operating Expenses**	**Logistics Expenses**	**Cooperative Agreements**	**To other USGS Centers**	**Burden**	**Total**
I.5	Evaluating the efficacy of flow experiments in the LTEMP sEIS to control smallmouth bass	$54,826	$1,000	$5,000	$1,050	$0	$0	$13,489	$75,365
I.6	Determining hatch dates of larval smallmouth bass in response to LTEMP sEIS flow experiments	$25,152	$2,000	$1,500	$11,102	$117,500	$0	$12,191	$169,445
Total		**$79,978**	**$3,000**	**$6,500**	**$12,152**	**$117,500**	**$0**	**$25,680**	**$244,810**

With 10% less, what would we cut?

- Reduce # of trips or length of trips in I.1 & I.3
- Reduce funding for cooperative agreements in I.1, I.2, & I.3; eliminate graduate student on parasite project; seek outside support for salary
- Reduce number of samples sent to outside laboratories for kinship analysis (I.2), eDNA analysis (I.3; or species we are looking for, e.g., parasites), and hatch date analysis (I.6)
- Reduce hours spent on tech team/SMB calls

What can we reduce and not sacrifice integrity?

- Find outside funding for FY25 upper LCR pool work to search for non-native species (G.8)
- Move SMB project in I.3 to Experimental Fund

FY 2026

Triennial Work Plan Budget

Project Element	Description	Salaries	Travel & Training	Operating Expenses	Logistics Expenses	Cooperative Agreements	To other USGS Centers	Burden	Total
I.1	System-wide native fishes and invasive aquatic species monitoring	$9,268	$0	$4,650	$166,900	$258,500	$0	$48,620	$487,938
I.2	Estimating kinship and spawner abundance of warm-water non-natives	$90,572	$0	$1,000	$0	$117,500	$0	$24,220	$233,292
I.3	Identifying emerging threats to the Colorado River Ecosystem using environmental DNA	$111,996	$1,200	$18,500	$29,842	$249,187	$0	$43,983	$454,709
I.4	Modeling population dynamics and improving forecasting tools for smallmouth bass and other non-native fish	$191,157	$1,000	$2,050	$0	$0	$0	$43,891	$238,098
Total		**$402,993**	**$2,200**	**$26,200**	**$196,742**	**$625,187**	**$0**	**$160,714**	**$1,414,036**

Compliance, Triggers, Goals

Needed for Compliance?	Needed for Exp Trigger?	Needed for Exp Action Analysis or Monitoring?	LTEMP Resource Goal	Nonnative Inv Species Metric
Yes (BO, LTEMP ROD)	No	Yes	#10	Yes
Yes (LTEMP sEIS)	No	Yes	#10	Maybe?
Yes (BO, LTEMP ROD)	No	Yes	#10	Yes
Yes (LTEMP sEIS)	No	Yes	#10	Yes

This project also addresses the NNF Strategic Plan

Experimental Fund Budget

LTEMP Flow Experiments									
Project Element	**Description**	**Salaries**	**Travel & Training**	**Operating Expenses**	**Logistics Expenses**	**Cooperative Agreements**	**To other USGS Centers**	**Burden**	**Total**
I.5	Evaluating the efficacy of flow experiments in the LTEMP sEIS to control smallmouth bass	$58,664	$1,000	$5,000	$1,050	$0	$0	$14,851	$80,565
I.6	Determining hatch dates of larval smallmouth bass in response to LTEMP sEIS flow experiments	$26,912	$2,000	$1,500	$11,316	$117,500	$0	$12,956	$172,184
Total		**$85,576**	**$3,000**	**$6,500**	**$12,366**	**$117,500**	**$0**	**$27,807**	**$252,749**

With 10% less, what would we cut?

- Eliminate eDNA sampling associated with backwater seining trip funded in Project G
- Reduce samples sent to outside cooperators for analysis and salary support; potentially develop capacity to run eDNA samples in-house
- Reduce footprint of experimental fish lab

FY 2027

Triennial Work Plan Budget

Project Element	Description	Salaries	Travel & Training	Operating Expenses	Logistics Expenses	Cooperative Agreements	To other USGS Centers	Burden	Total
I.1	System-wide native fishes and invasive aquatic species monitoring	$9,916	$0	$4,650	$172,092	$258,500	$0	$51,433	$496,592
I.2	Estimating kinship and spawner abundance of warm-water non-natives	$96,912	$0	$1,000	$0	$117,500	$0	$26,436	$241,848
I.3	Identifying emerging threats to the Colorado River Ecosystem using environmental DNA	$119,836	$1,200	$18,500	$30,822	$125,263	$0	$43,622	$339,243
I.4	Modeling population dynamics and improving forecasting tools for smallmouth bass and other non-native fish	$204,538	$1,000	$2,050	$0	$0	$0	$48,576	$256,163
Total		**$431,202**	**$2,200**	**$26,200**	**$202,914**	**$501,263**	**$0**	**$170,067**	**$1,333,846**

Compliance, Triggers, Goals

Needed for Compliance?	Needed for Exp Trigger?	Needed for Exp Action Analysis or Monitoring?	LTEMP Resource Goal	Nonnative Inv Species Metric
Yes (BO, LTEMP ROD)	No	Yes	#10	Yes
Yes (LTEMP sEIS)	No	Yes	#10	Maybe?
Yes (BO, LTEMP ROD)	No	Yes	#10	Yes
Yes (LTEMP sEIS)	No	Yes	#10	Yes

This project also addresses the NNF Strategic Plan

Experimental Fund Budget

LTEMP Flow Experiments									
Project Element	**Description**	**Salaries**	**Travel & Training**	**Operating Expenses**	**Logistics Expenses**	**Cooperative Agreements**	**To other USGS Centers**	**Burden**	**Total**
I.5	Evaluating the efficacy of flow experiments in the LTEMP sEIS to control smallmouth bass	$62,770	$1,000	$5,000	$1,050	$0	$0	$16,338	$86,158
I.6	Determining hatch dates of larval smallmouth bass in response to LTEMP sEIS flow experiments	$28,796	$2,000	$1,500	$11,536	$117,500	$0	$13,782	$175,114
Total		**$91,567**	**$3,000**	**$6,500**	**$12,586**	**$117,500**	**$0**	**$30,120**	**$261,272**

Is there data that does not need annual collection?

- Reduce annual frequency of trips in I.1 & I.3
- Potentially collect humpback chub parasite data every other year

Can monitoring trips be combined with others?

- Non-native warm-water fish surveillance work incorporated into H.1 & H.2
- NNF seining boat in G.5 integrated with I.3
- New antenna work associated with Project I.1 funded in Project G.8
- Smallmouth bass diet work that will inform models in I.4 is funded in Project F.4
- All of the SMB samples collected in Project I.2 & I.6 are collected during other trips

Smallmouth Bass Research & Monitoring

Determining the effectiveness of removals & potential flow experiments

Abundance/ Catch

- CPUE using fish trip data
- Close-kin mark-recapture analysis (I.2)

Distribution/ Dispersal

- Occupancy/catch by river mile using fish trip data (I.4)

Growth

- Modal progression analysis of fish trip data
- SMB diet data (F.4)

Reproduction

- Side scan sonar for nests – pilot
- Artificial nest substrate – pilot
- Capture of juveniles on fish trips
- NPS snorkel surveys

No evidence of YOY

Evidence of YOY → **Growth of YOY**

- Modal progression analysis of fish trip data

Entrained from Lake?

- Ongoing entrainment studies (USBR)
- Kinship analysis (I.2)
- eDNA entrainment study (I.3)

Reproduced locally?

- Hatch data/otolith analysis (I.6)
- Sampling slough
  - NPS Removals
  - Trout sampling (H.1/H.2)

When? (relative to experimental actions)

- Hatch data/otolith analysis (I.6)

Modeling

- Update SMB forecasting tools, if new information available, e.g. lab trials (I.4)
- Close-kin mark-recapture model (I.4)
- Occupancy model (G.1, I.4, N.1)
- Determine effectiveness of management actions, if data of suff. quality (I.4, I.5)

Monitoring and Effectiveness Criteria:

- Distribution of invasive fish
- Population numbers and evidence of spawning
- Effectiveness of the action
- Current stage along invasion curve

Other suggestions from NNF Strategic Plan:

- 1-2 additional, focused monitoring trips
- Expand existing trips (1-2 days, personnel)
- Citizen science/outreach
- Map of downstream potential spawning habitat

Fish Trips

- **Lees Ferry**
  - NPS Removal trips
    - April-November
    - Electrofishing bi-weekly
    - Netting bi-weekly
    - GRCA – PBR Reach
  - Trout monitoring (H.1/H.2)
    - January, April, June, Nov
    - 2 fixed sites (near -13 and -4 RM); potential random sites
    - 1-2 days NNF surveillance in slough and other hot spots
  - eDNA sampling (I.3)
    - Focused on entrainment
    - Detecting new species
    - Sampling associated with SMB flows – distribution
- **Downstream**
  - JCM-East & JCM-West (G.3 & G.6)
    - April/May, July, October
  - AGFD System-wide sampling (I.1)
    - Two potential spring trips
    - Added system-wide trip in fall to increase NNF detections
    - Increased # of trip days by 2
  - Aggregations monitoring (G.5)
    - Added backwater seining boat on fall trip, with eDNA (I.3)
  - NPS system-wide trip in fall (seining, eDNA)
  - Sampling springs/upper pools in LCR (G.8), with eDNA (I.3)
  - Parasite monitoring in LCR and mainstem river (I.3)