



GCMRC FY 2021-23 Triennial Workplan and Budget – 4th Draft

**Adaptive Management Work Group Meeting
August 19-20, 2020**

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LTEMP Implementation

| Objectives And Resource Goals Of The LTEMP | Resource Areas to be Evaluated and Considered Before Any Experiment |
|--|---|
| Archaeological and Cultural Resources | Water Quality and Water Delivery |
| Natural Processes | Humpback Chub |
| Humpback Chub | Sediment |
| Hydropower and Energy | Riparian Ecosystems |
| Other Native Fish | Historic Properties and Traditional Cultural Properties |
| Recreational Experience | Hydropower Production and WAPA's Assessment of the Status of the Basin Fund |
| Sediment | Rainbow Trout Fishery |
| Tribal Resources | Recreation |
| Rainbow Trout Fishery | Tribal Concerns/Resources |
| Nonnative Invasive Species | Other Resources |
| Riparian Vegetation | |

A. Streamflow, Water Quality, and Sediment Transport and Budgeting in the Colorado River Ecosystem

LTEMP Resource Areas:

- Water Quality and Water Delivery
- Sediment
- Natural Processes

FY18: \$1,230,000

FY19: \$1,201,000

FY20: \$1,280,000

Project Elements

1. Stream gaging** and hydrologic analyses
2. Continuous water-quality parameters
3. Sediment transport and budgeting
4. HFE monitoring (Experimental Fund)

FY21: \$1,228,000*

FY22: \$1,147,000*

FY23: \$1,209,000*

(*Provisional estimates, subject to revision)

(**Funding for LCR and Havasu gage included in 4th draft)

B. Sandbar and Sediment Storage Monitoring and Research

Project Elements

1. Sandbar and campsite monitoring with topographic surveys and remote cameras
2. Bathymetric and topographic mapping for monitoring long-term trends in sediment storage
3. Control network and survey support
4. Bank erosion, bed sedimentation, and channel change in western Grand Canyon**
5. Streamflow and sandbar modeling***
- 6-9. Sandbar and river channel response to experimental actions (Experimental Fund)

FY18: \$1,039,000

FY19: \$1,050,000

FY20: \$1,015,000

FY21: \$1,023,000*

FY22: \$907,000*

FY23: \$994,000*

LTEMP Resource Areas:

- Sediment
- Archaeological and Cultural Resources
- Natural Processes
- Recreational Experience

(*Provisional estimates, subject to revision)

(**Included in Project O in 4th draft – Experimental Fund)

(***Not funded in 4th draft)

C. Riparian Vegetation Monitoring and Research



Project Elements

1. Ground-based riparian vegetation monitoring
2. Determining hydrological tolerances and management tools for plant species of interest
3. Predictive models and synthesis
4. Vegetation management decision support

FY18: \$585,000

FY19: \$515,000

FY20: \$515,000

FY21: \$326,000*

FY22: \$333,000*

FY23: \$341,000*

LTEMP Resource Areas:

- Riparian Vegetation
- Natural Processes
- Recreational Experience

(*Provisional estimates, subject to revision)

D. Effects of Dam Operations and Vegetation Management for Archaeological Sites

FY18: \$262,000
FY19: \$269,000
FY20: \$284,000

FY21: \$306,000*
FY22: \$301,000*
FY23: \$304,000*

LTEMP Resource Areas:

- Sediment
- Riparian Vegetation
- Archaeological and Cultural Resources
- Natural Processes

Project Elements

1. Dam operations, vegetation management, archaeological sites
2. Monitoring landscape-scale ecosystem change with repeat photography**
3. Cultural program history**
4. Geomorphic research in support of NHPA compliance activities***

(*Provisional estimates, subject to revision)

(**Funding reduced in 4th draft per TWG recommendation)

(***No funding requested)

E. Controls on Ecosystem Productivity: Nutrients, Flow, and Temperature

Project Elements

1. Phosphorus budgeting in the Colorado River
 - Identify the relative importance of different phosphorus sources to the productivity of the Colorado River system
2. Rates and composition of primary producers in the Colorado River
 - Identify patterns and controls on primary productivity in the Colorado River
3. Productivity at higher trophic levels
 - Fish metabolism and ecosystem modeling

FY18: \$343,000

FY19: \$254,000

FY20: \$284,000

FY21: \$408,000*

FY22: \$294,000*

FY23: \$287,000*

LTEMP Resource Areas:

- Water Quality and Water Delivery
- Other Resources (Food Base)
- Natural Processes

(*Provisional estimates, subject to revision)

F. Aquatic Invertebrate Ecology (Food Base)

Project Elements

1. Aquatic invertebrate monitoring in Marble and Grand Canyons
2. Aquatic invertebrate monitoring in Glen Canyon
3. Aquatic invertebrate monitoring of Grand Canyon tributaries
4. Fish diet studies

FY18: \$771,000

FY19: \$746,000

FY20: \$718,000

FY21: \$766,000*

FY22: \$709,000*

FY23: \$700,000*

LTEMP Resource Areas:

- Other Resources (Food Base)
- Natural Processes

G. Humpback Chub Population Dynamics Throughout the Colorado River



LTEMP Resource Areas:

- Humpback Chub
- Natural Processes

Project Elements

1. Humpback chub population monitoring
2. Annual spring/fall abundance estimates of humpback chub in the lower 13.6 km of the LCR
3. Juvenile chub monitoring near the LCR confluence
4. Remote PIT tag array monitoring in the LCR
5. Monitoring humpback chub aggregation relative abundance and distribution
6. Juvenile humpback chub monitoring – west**
7. Chute Falls translocations
8. Backwater seining***
9. Assessing yearly variability in humpback chub hatch dates***

FY18: \$1,506,000

FY19: \$1,637,000

FY20: \$1,632,000

FY21: \$1,661,000*

FY22: \$1,835,000*

FY23: \$1,598,000*

(*Provisional estimates, subject to revision) (**Not funded in 4th draft)

(**Prioritize unspent and unprogrammed funds to this work in FY2023)

H. Salmonid Research and Monitoring

Project Elements

1. Rainbow Trout Monitoring in Glen Canyon
2. Experimental flow assessment of trout recruitment**
3. Brown Trout early life history stages in Glen Canyon
4. Salmonid modelling

FY18: \$683,000

FY19: \$717,000

FY20: \$667,000

FY21: \$595,000*

FY22: \$648,000*

FY23: \$514,000*

(*Provisional estimates, subject to revision)

(**Funding for additional TRGD sampling site shifted from FY2021 to FY2022 in 4th draft)

LTEMP Resource Areas:

- Rainbow Trout Fishery
- Humpback Chub
- Nonnative Invasive Species
- Recreational Experience
- Natural Processes

I. Warm-water Native and Non-Native Fish Monitoring and Research

LTEMP Resource Areas:

- Other Native Fish
- Nonnative Invasive Species
- Recreational Experience
- Natural Processes

Project Elements

1. System-wide native fish and invasive aquatic species monitoring
2. Invasion and colonization dynamics of warm-water invasive fishes
3. Impacts of channel catfish on native fish in the Little Colorado River

FY18: \$557,000

FY19: \$581,000

FY20: \$598,000

FY21: \$553,000*

FY22: \$671,000*

FY23: \$658,000*

(*Provisional estimates, subject to revision)

J. Socioeconomic Research

Project Elements

1. Predictive models for adaptive management
 - a) Humpback Chub
 - b) Sandbars
2. Brown trout incentivized harvest
3. Recreation monitoring and research
 - a) Recreational surveys during flow experiments (Experimental Fund)

LTEMP Resource Areas:

- Humpback Chub
- Sediment
- Nonnative Invasive Species
- Recreational Experience

FY18: \$281,000

FY19: \$237,000

FY20: \$243,000

FY21: \$209,000*

FY22: \$204,000*

FY23: \$193,000*



(*Provisional estimates, subject to revision)

K. Geospatial Science, Data Management and Technology

FY18: \$302,000

FY19: \$274,000

FY20: \$320,000

FY21: \$424,000*

FY22: \$464,000*

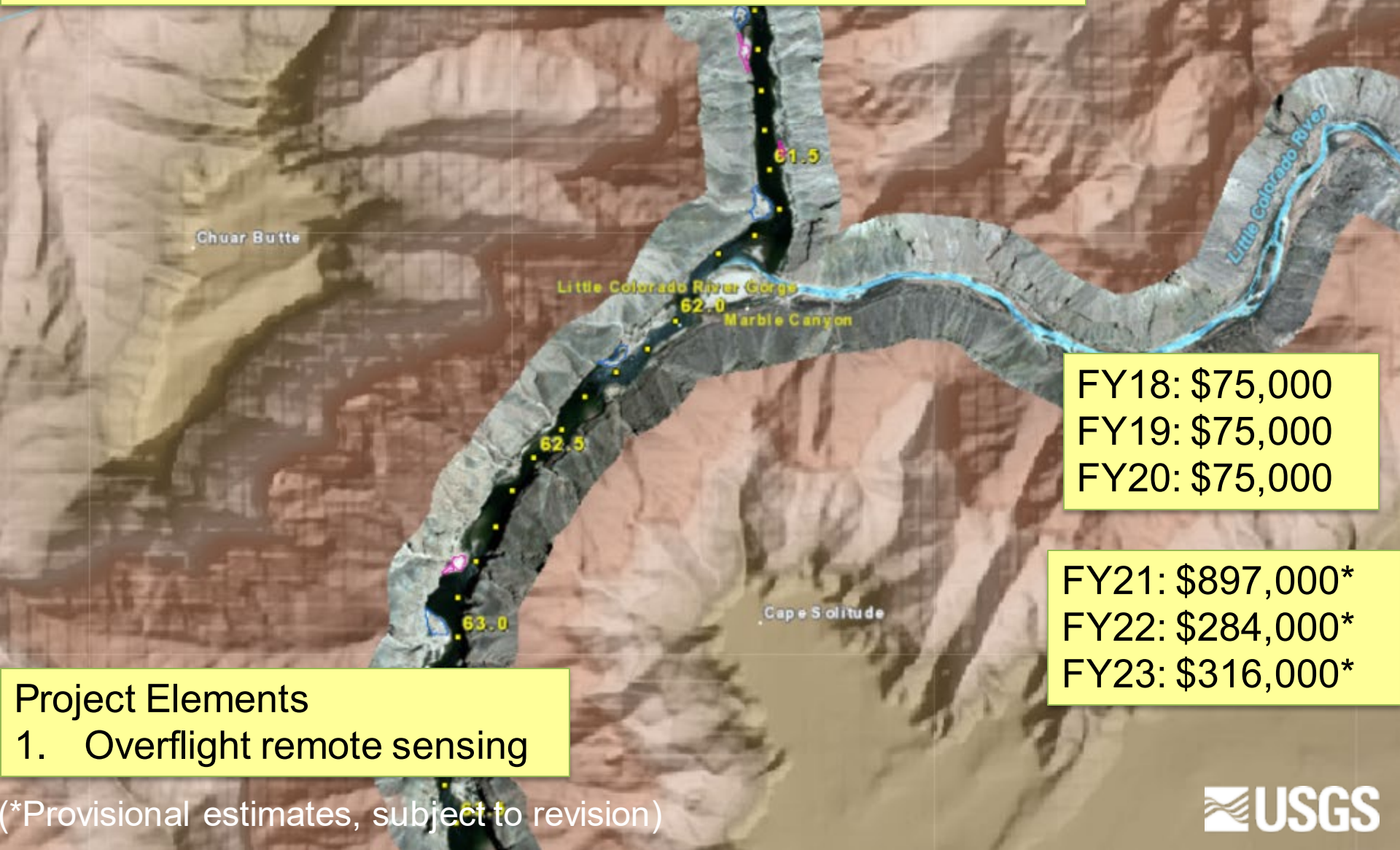
FY23: \$511,000*

Project Elements

1. Enterprise GIS, geospatial analysis and processing
2. Data management and database administration
3. Remote monitoring and advanced technology support

(*Provisional estimates, subject to revision)

L. Remote Sensing Overflight in Support of Long-Term Monitoring and LTEMP



FY18: \$75,000
FY19: \$75,000
FY20: \$75,000

FY21: \$897,000*
FY22: \$284,000*
FY23: \$316,000*

Project Elements

1. Overflight remote sensing

(*Provisional estimates, subject to revision)

M. Leadership, Management, and Support

FY18: \$1,375,000

FY19: \$1,356,000

FY20: \$1,444,000

FY21: \$1,406,000*

FY22: \$1,427,000*

FY23: \$1,479,000*

Project Elements

1. Salaries

- Leadership
- Program manager
- Support staff
- Logistics staff

2. Travel and training

3. Vehicle costs

4. IT supplies and support

(*Provisional estimates, subject to revision)

N. Hydropower Monitoring and Research

FY18: \$11,000

FY19: \$12,000

FY20: \$13,000

FY21: \$28,000*

FY22: \$25,000*

FY23: \$26,000*

LTEMP Resource Areas:

- Hydropower and Energy

Project Elements

1. Hydropower monitoring and research**

(*Provisional estimates, subject to revision)

(**Text revised as requested by TWG in 4th draft. Additional revisions as requested by WAPA/CREDA will be included in 5th draft)

O. Evaluating Resource Response to Spring Disturbance Flows**

FY21: \$350,000*
FY22: \$350,000*
FY23: \$317,000*

LTEMP Resource Areas:

- Archeological and cultural resources
- Natural Processes
- Humpback chub
- Hydropower and energy
- Other native fish
- Recreational experience
- Sediment
- Tribal resources
- Rainbow trout fishery
- Nonnative invasive species
- Riparian vegetation

Project Elements

1. Does disturbance timing affect food base response?
2. Bank erosion, bed sedimentation, and channel change in western Grand Canyon
3. Aeolian response to a spring pulse flow
4. Riparian vegetation physiological response
5. Mapping aquatic vegetation response to a spring pulse flow
6. Brown trout early life stage response to a spring pulse flow
7. Native fish movement in response to a spring pulse flow
8. Do disturbance flows significantly impact recreational experience?
9. Are there opportunities to meet hydropower and energy goals with spring disturbance flows? (funded in N.1)
10. Sandbar and campsite response to spring disturbance flow (funded in B.1)
11. Decision Analysis

(*Provisional estimates, subject to revision)

(**New project added to 4th draft per TWG recommendation. All funding from Experimental Fund and work contingent upon approval of spring disturbance or other flows)

Lake Powell Water Quality (Not Funded by the GCDAMP)

Project Elements

1. Monitor water-quality status and trends in Lake Powell and Glen Canyon Dam releases
2. Historical data analysis - towards improved predictive capacity for reservoir nutrient dynamics
3. Characterizing nutrient dynamics during experimental flows
4. Improving access to historical dataset

FY18: \$197,000

FY19: \$208,000

FY20: \$212,000

FY21: \$218,000*

FY22: \$224,000*

TWG Motion and Recommendations

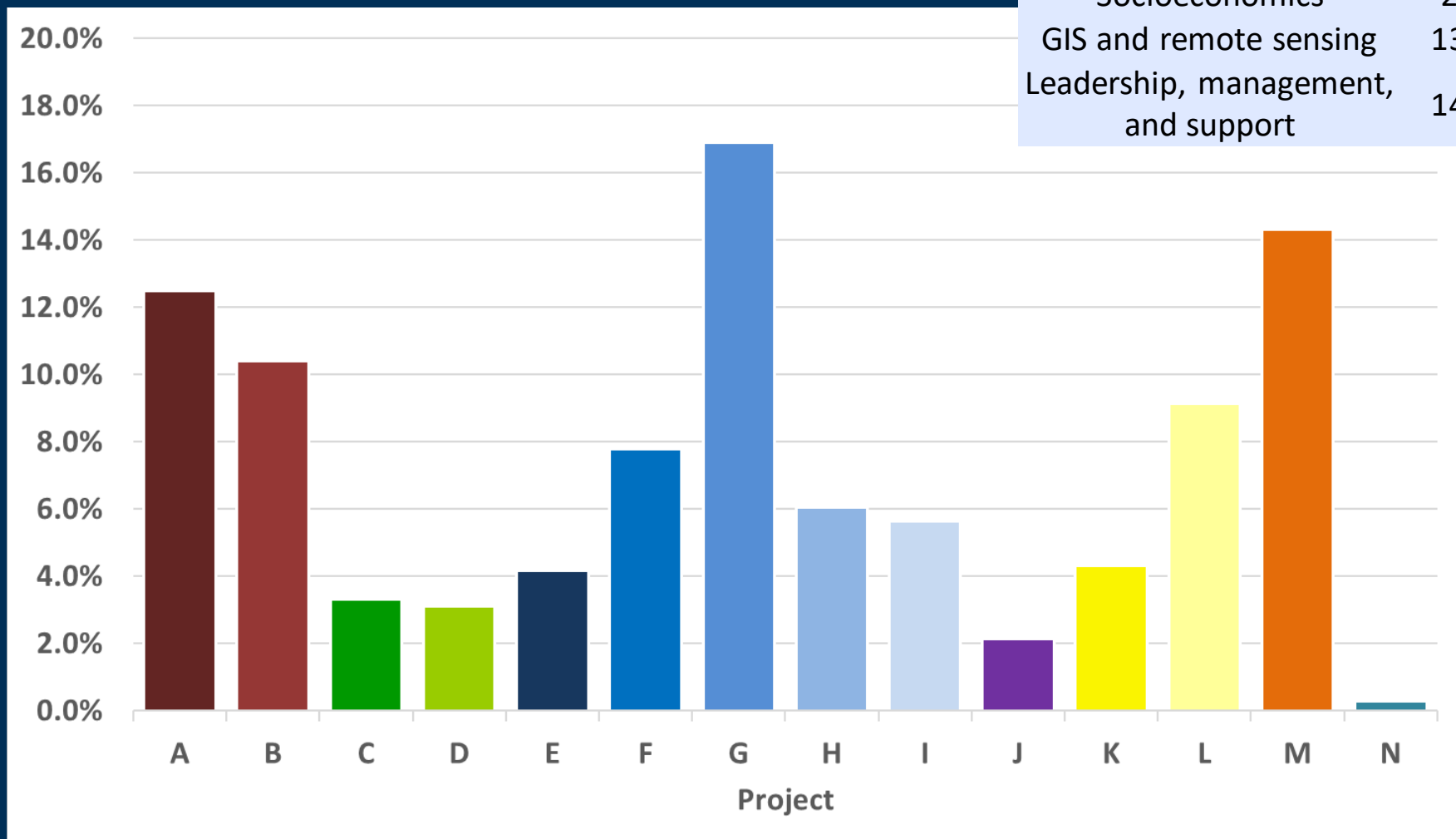
1. Include the GCMRC B.4 work element in the budget.
 - *Added as Project Element O.2*
2. Remove and/or reduce GCMRC D.2 and GCMRC D.3
 - *Reduced to support gages*
3. Include Havasu Creek and LCR-mouth gage in GCMRC A.1
 - *Included using funds from D.2 and D.3*
4. Please change GCMRC Project N verbiage (Pg 294) from “*For example, modeling a change in ramp rates to maintain or improve the hydropower and recreational resource objectives is a possible application of GCMRC Project N.*” to: “*For example, modeling a change in ramp rates to improve the hydropower resource objective is a possible application of Project N.*”
 - *Changed verbiage as requested*

TWG Motion and Recommendations, cont.

1. In accordance with direction provided by the AMWG as described in the FLAHG charge, include a project and/or project element to support the FLAHG charge, and provide funding if necessary.
 - *Added Project O*
2. Remove Reclamation B.4, TWG Chair reimbursement.
 - *Addressed on Reclamation side of budget*
3. Propose AGFD and GCMRC look to integrate work efforts to allow for an additional TRGD site to be monitored.
 - *Two trips in FY2021 and FY2022, discussions ongoing*
4. Prioritize the use of available, unprogrammed and unspent funds from FY 2020, 2021 and 2022 towards funding GCMRC G.6 (JCM-West) in 2023.
 - *Prioritize unspent and unprogrammed funds to G.6 in FY2023*

Potential allocation of FY2021 funding** based on GCMRC/agency assessment of stakeholder interests and feedback, scientific issues, and monitoring mandates in support of LTEMP implementation

| | |
|-------------------------------------|------|
| Geophysical sciences | 23%* |
| Vegetation & effects of management | 7%* |
| Aquatic and fish science | 41%* |
| Socioeconomics | 2%* |
| GIS and remote sensing | 13%* |
| Leadership, management, and support | 14%* |

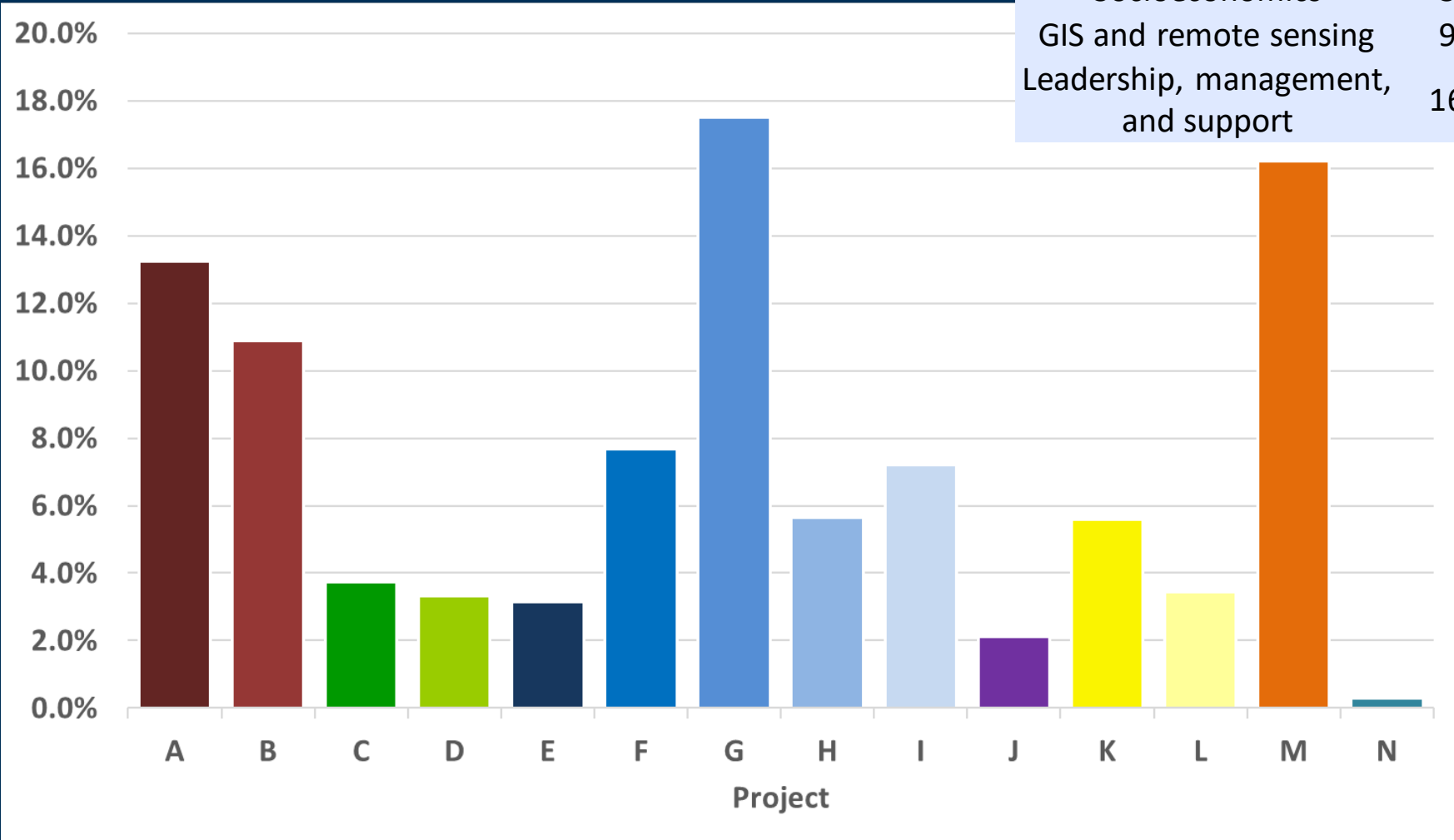


(*Provisional estimates, subject to revision)

(** Excludes Project O and other Experimental Fund proposals)

Proportions remain relatively unchanged for potential allocations in FY2022 and FY2023 (FY2023 shown)

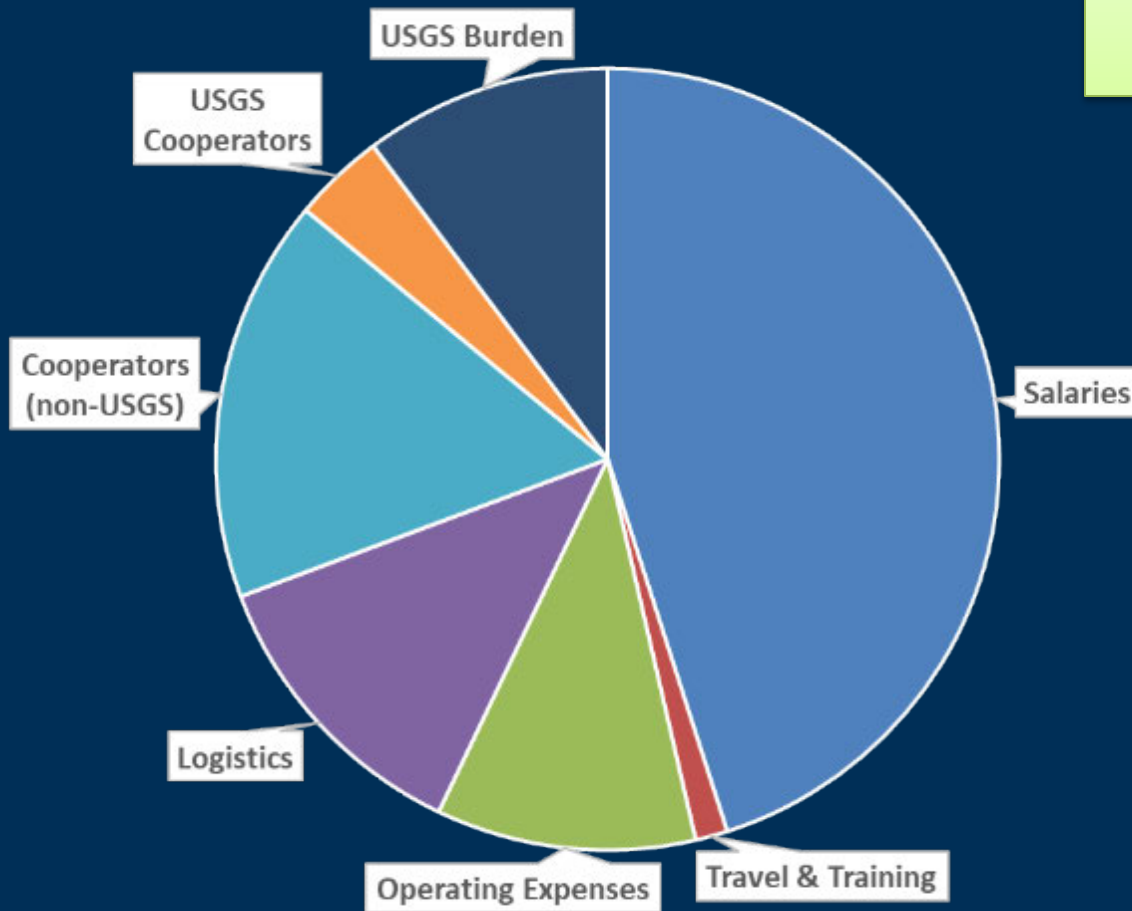
| | |
|-------------------------------------|------|
| Geophysical sciences | 24%* |
| Vegetation & effects of management | 7%* |
| Aquatic and fish science | 41%* |
| Socioeconomics | 3%* |
| GIS and remote sensing | 9%* |
| Leadership, management, and support | 16%* |



(*Provisional estimates, subject to revision)
(** Excludes Project O and other Experimental Fund proposals)



Potential Allocation of FY2021 budget**; proportions by general categories



| Categories | |
|------------------------|------|
| Salaries | 45%* |
| Travel & Training | 1%* |
| Operating Expenses | 11%* |
| Logistics | 12%* |
| Cooperators (non-USGS) | 17%* |
| USGS Cooperators | 4%* |
| USGS Burden | 10%* |

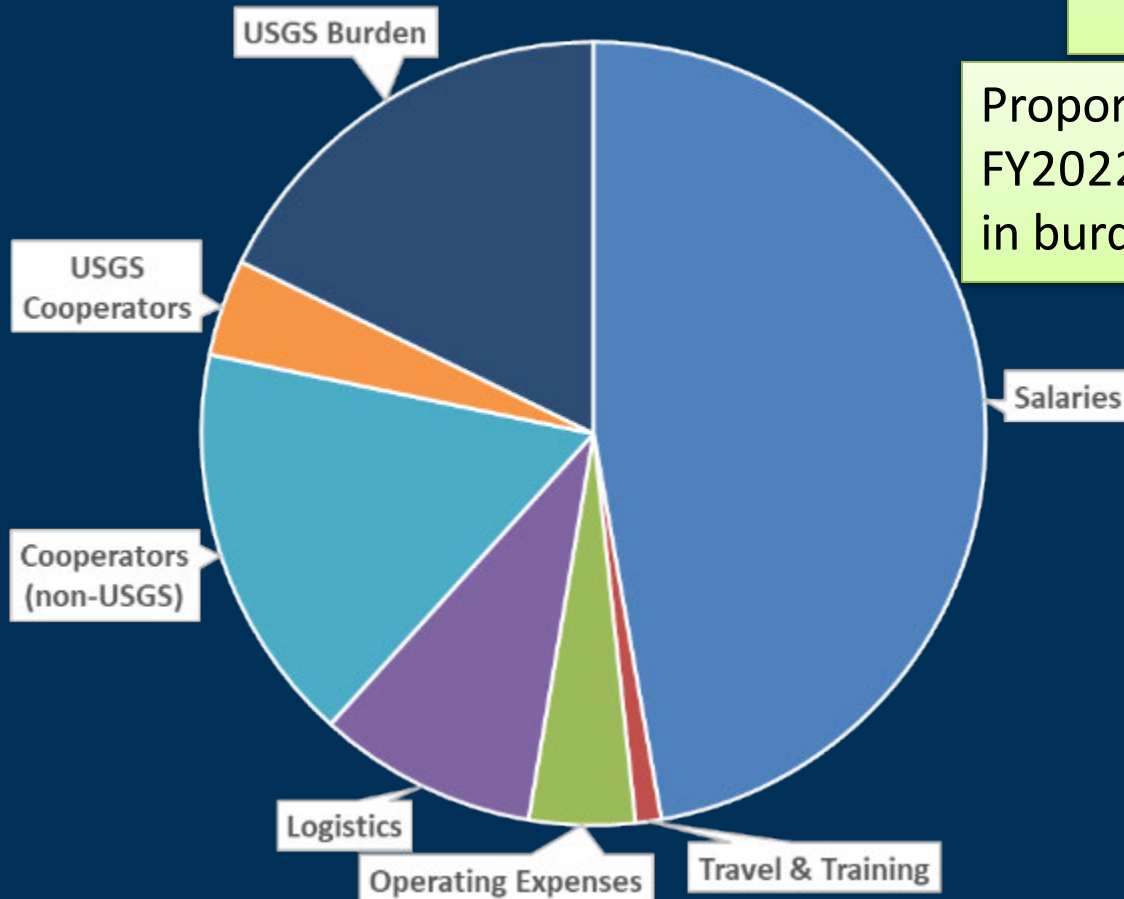
Burden rates:
USGS – 14%*
Pass through – 3%*
Sub-allocation – 0%*

(*Provisional estimates, subject to revision)

(** Excludes Project O and other Experimental Fund proposals)

Potential Allocation of FY2023 budget**; proportions by general categories

Proportions are relatively similar for FY2022 and FY2023, with increases in burden rate in FY2022 and FY2023



| Categories | |
|------------------------|------|
| Salaries | 47%* |
| Travel & Training | 1%* |
| Operating Expenses | 4%* |
| Logistics | 9%* |
| Cooperators (non-USGS) | 17%* |
| USGS Cooperators | 4%* |
| USGS Burden | 18%* |

Burden rates:
USGS – 28%*
Pass through – 3%*
Sub-allocation – 0%*

(*Provisional estimates, subject to revision)

(** Excludes Project O and other Experimental Fund proposals)

Proposed FY2021-23 Triennial Workplan*

| <u>Project</u> | <u>FY2021</u> | <u>FY2022</u> | <u>FY2023</u> |
|---|---------------------|---------------------|---------------------|
| A. Streamflow, Water Quality, and Sediment Transport | \$ 1,228,000 | \$ 1,147,000 | \$ 1,209,000 |
| B. Sandbar and Sediment Storage Monitoring and Research | \$ 1,023,000 | \$ 907,000 | \$ 994,000 |
| C. Riparian Vegetation | \$ 326,000 | \$ 333,000 | \$ 341,000 |
| D. Effects of Dam Operations and Vegetation Management for Archaeological Sites | \$ 306,000 | \$ 301,000 | \$ 304,000 |
| E. Nutrients, Flow, and Temperature as Ecosystem Drivers | \$ 408,000 | \$ 294,000 | \$ 287,000 |
| F. Aquatic Invertebrate Ecology | \$ 766,000 | \$ 709,000 | \$ 700,000 |
| G. Humpback Chub Monitoring and Research | \$ 1,661,000 | \$ 1,835,000 | \$ 1,598,000 |
| H. Salmonid Monitoring and Research | \$ 595,000 | \$ 648,000 | \$ 514,000 |
| I. Warm-water Native and Non-Native Fish Monitoring and Research | \$ 553,000 | \$ 671,000 | \$ 658,000 |
| J. Socioeconomic Research | \$ 209,000 | \$ 204,000 | \$ 193,000 |
| K. Geospatial Science, Data Management, and Technology | \$ 424,000 | \$ 464,000 | \$ 511,000 |
| L. Overflight Remote Sensing | \$ 897,000 | \$ 284,000 | \$ 316,000 |
| M. Leadership, Management, and Support | \$ 1,406,000 | \$ 1,427,000 | \$ 1,492,000 |
| N. Hydropower Monitoring and Research | \$ 28,000 | \$ 25,000 | \$ 26,000 |
| Total | \$ 9,830,000 | \$ 9,249,000 | \$ 9,130,000 |
| Anticipated AMP Funding Available (80.0% and 0% CPI) | \$ 9,088,000 | \$ 9,088,000 | \$ 9,088,000 |
| Overflight Carryover: FY2018-20 savings + logistics funding from 2020 cancelled trips | \$ 445,000 | \$ - | \$ - |
| Anticipated Carryover Funding From Previous Fiscal Year | \$ 500,000 | \$ 203,000 | \$ 42,000 |
| Long/Short | \$ 203,000 | \$ 42,000 | \$ - |
| Lake Powell Water Quality Monitoring: NOT GCDAMP Funded | \$ 218,000 | \$ 224,000 | N/A |
| Project O. Spring Disturbances (Experimental Fund) | \$ 350,000 | \$ 350,000 | \$ 317,000 |
| Other Experimental Fund Proposals | \$ 735,000 | \$ 787,000 | \$ 821,000 |

Questions?

