Core monitoring

Core Monitoring Information Need: Core monitoring is consistent, long-term, repeated measurements using set protocols and is designed to establish status and trends in meeting specific management objectives. Core monitoring is implemented on a fixed schedule regardless of variable factors or circumstances (e.g., water year, experimental flows, temperature control, stocking strategy, non-native control, etc.) affecting target resources.

The value of core monitoring

- Decisiveness
- Consistency
- longevity

Assumptions

- Use available technology, as appropriate
- Remote sensing is integral and interdisciplinary
- Minimalist framework
- Meet the needs of stakeholders
- Development is collaborative (TWG Ad Hoc)
- Assume level funding
- 40-60% of our budget
- Build for consistency
- Build for longevity (10+ years)
- Based on solid experimental design and power analysis
- Try to be succinct
- Whatever we generate will be reviewed by SAB, TWG and AMWG

Core Monitoring

- **Resources to be monitored:**
  - A. Sediment
  - B. Vegetation
  - C. Fish
  - D. Food base
  - E. Cultural Resources
  - F. Hydrology
  - G. Water Quality
  - H. Recreation
  - I. Threatened and endangered species

For Each Resource….

- What do managers want to know?
- Where do they want to know it?
- How frequently do they need to know?
- What are the general methods to obtain this information?
- What is the level of accuracy needed

Sediment

- **What:**

  1.Is there any significant change in the trend of sand storage over time?

  2.What is the effect of natural perturbations on sediment storage?

- **Where:** Lees Ferry, Marble Canyon, below the Lower Colorado River
- **How often:** Fine sediment storage- every 2 years

- **Methods:** Sand bar area & Volume

  Mass balance sediment transport determinations

Vegetation

1. What: Status of non-native plant species along the river?
2. What: Status of the old high-water zone vegetation?
3. What: Changes in plant communities? (area, location)

- **Where:** CRE
- **When:** Every 5 years
- **Methods:** Remote sensing will be used for macro-trend analysis. Invasive species and community competition will require some field sampling and ground truthing.

Fish

- What? 1.Status and trends of Humpback Chub (population levels, location, demographics).
- 2.Status and trend of Lees Ferry Rainbow Trout, (population and proportional stock density).
- 3.Status and trends of native species (non-endangered):
  - a. **Western Speckled Dace**
  - **b. Flannelmouth Sucker**
  - **c. Bluehead Sucker**
- 4. Status and trends of non-native fish species in the Grand Canyon.
- 5. Status and trends, and distribution and abundance of nearshore-rearing habitat in the CRE?
- **Where: CRE**
- **When: Annually**

Fish cont….methods

Lees Ferry Rainbow Trout:

1. **Where: Dam to Lees Ferry**
2. **When: Annually**
3. **Methodology: Semi-annual sampling using electrofishing techniques**

Humpback Chub

1. **Where: LCR and confluence zone**
2. **When: Annually**
3. **Methodology: One mark/recapture sampling every year, using Hoop netting/Trammel netting techniques**

Fish cont….methods

- **Native species**
  1. **Where: CRE**
  2. **When: Annually**
  3. **Method: Hoop net and trammel nets**

- **Non-native fish species**
  1. **Where: CRE**
  2. **When: Annually**
  3. **Method: Electrofishing, random sampling**

Food base

- What: Status and trend of primary productivity, composition of the benthic and drift invertebrate community, and utilization by fish community in the CRE
  - a. How is the food base changing over time?
  - b. Is there sufficient food to feed the fish?
  - c. Is the food base available to the fish (drift)?
- Where: CRE
- When: Annually
- Methods: Metabolism measurement, carbon budget, benthic dredge, drift nets

Cultural Resources (tentative)

- 1.What: Status and trend of cultural properties in the CRE?
- Where: the entire CRE
- When: Once every 5 years for each site, annually for a subset of sites.
- Methods: Remote sensing supplemented by site visits

Hydrology

- 1.What: Flows (CFS) in various points in the mainstem and certain tributaries?
- Where: CRE- Lees Ferry, Sixty-mile, Grand Canyon, Diamond Creek, Paria, LCR, and selected lesser tributaries in Marble Canyon
- When: Continuous
- Methods: Selected Conventional Combined with Surrogate In Situ Monitors and USGS Gauges

Water Quality

- 1.What: Status and trends of water quality (temperature, DO (dissolved oxygen), conductivity, pH, turbidity)
- Where: CRE- Glen Canyon, Lees Ferry, Grand Canyon, Diamond Creek
- When: Continuous
- Methods: in situ sensors

Recreation (tentative)

- 1.What: The level of visitor satisfaction with the recreational activities in the CRE?
- Where: CRE wide- anglers at Lees Ferry, private boaters, commercial river-running clients
- When: every 5 years
- Methods: Visitor Satisfaction Survey

Other Threatened & Endangered Species (e.g. KAS)

- What: Status and trends of Kanab ambersnail habitat at Vasey's Paradise?
- Where: Vasey's Paradise
- When: every 3 years
- Methods: Remote sensing, with annual presence/absence surveys of Kanab ambersnail