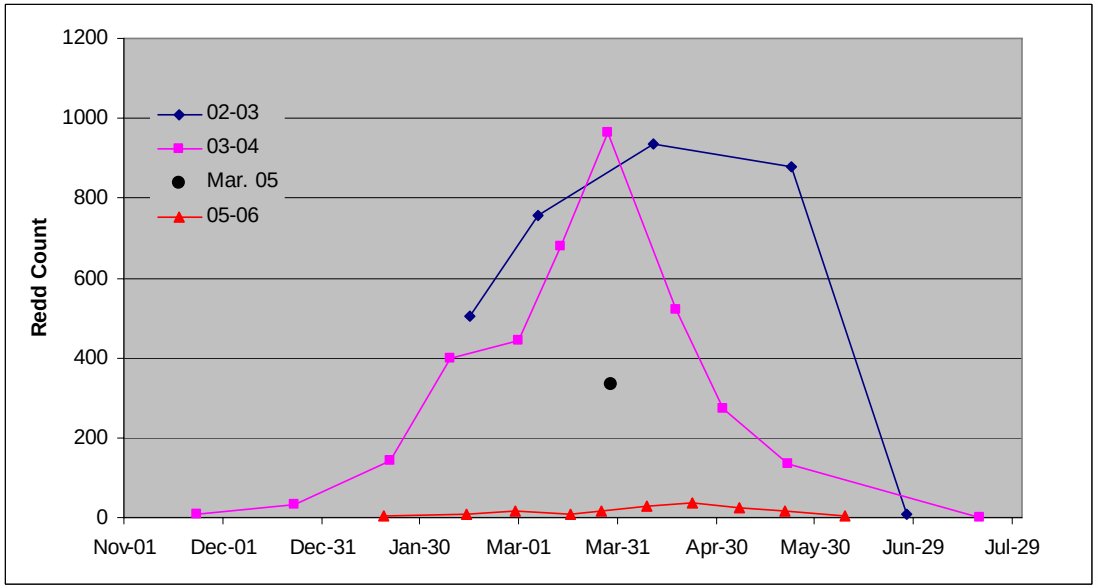
Rainbow Trout Early Life Stage Survival (RTELSS): 2006 Project Update

- Comparison of Redd Counts 2003-2006
- Comparison of 2004-2006 Fry Catch
- Integrated Stock Assessment Model for evaluating effects of experimental flows and other GCD effects.
- Future Field Work, Analysis, and Documentation



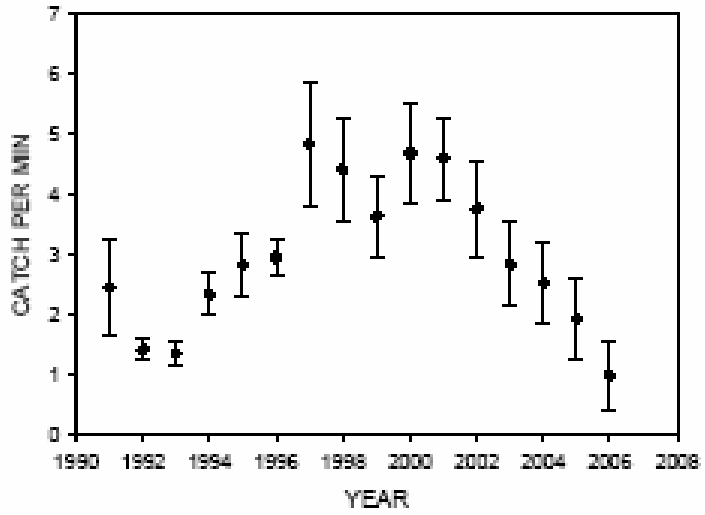
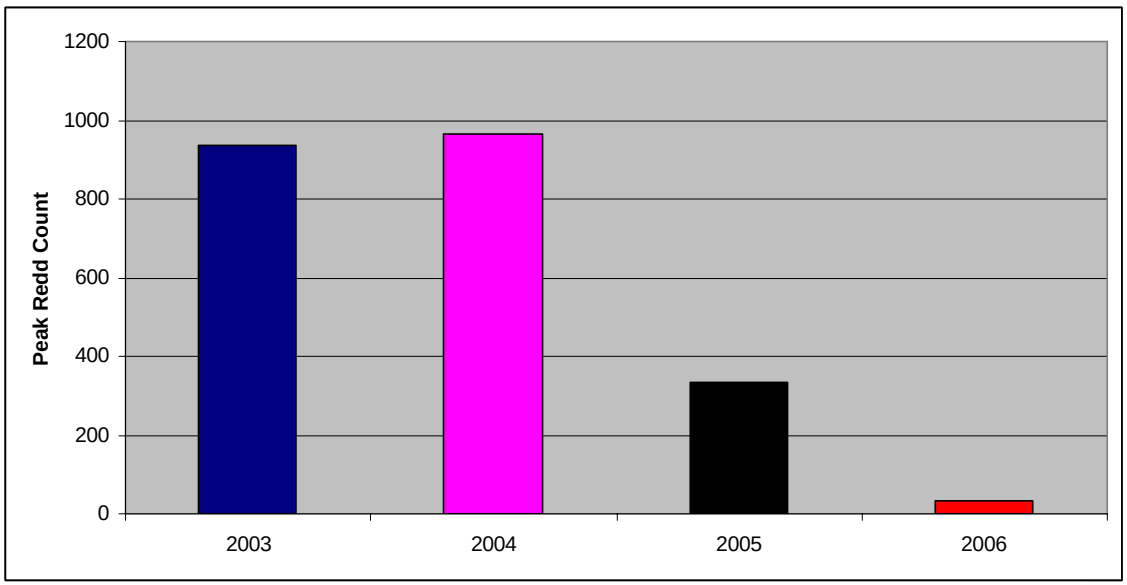


Figure 1. Mean catch per minute (electroshocking) for rainbow trout (RBT) by
fixed sites (Lee's ferry 1991-2006, error bars = 2*SE).



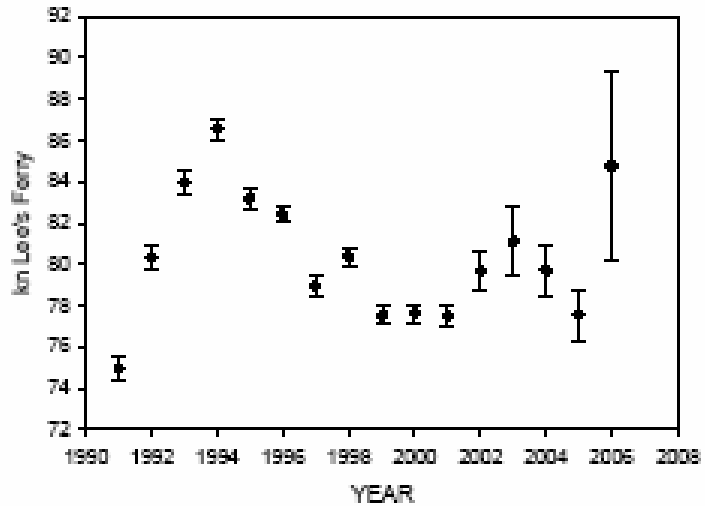
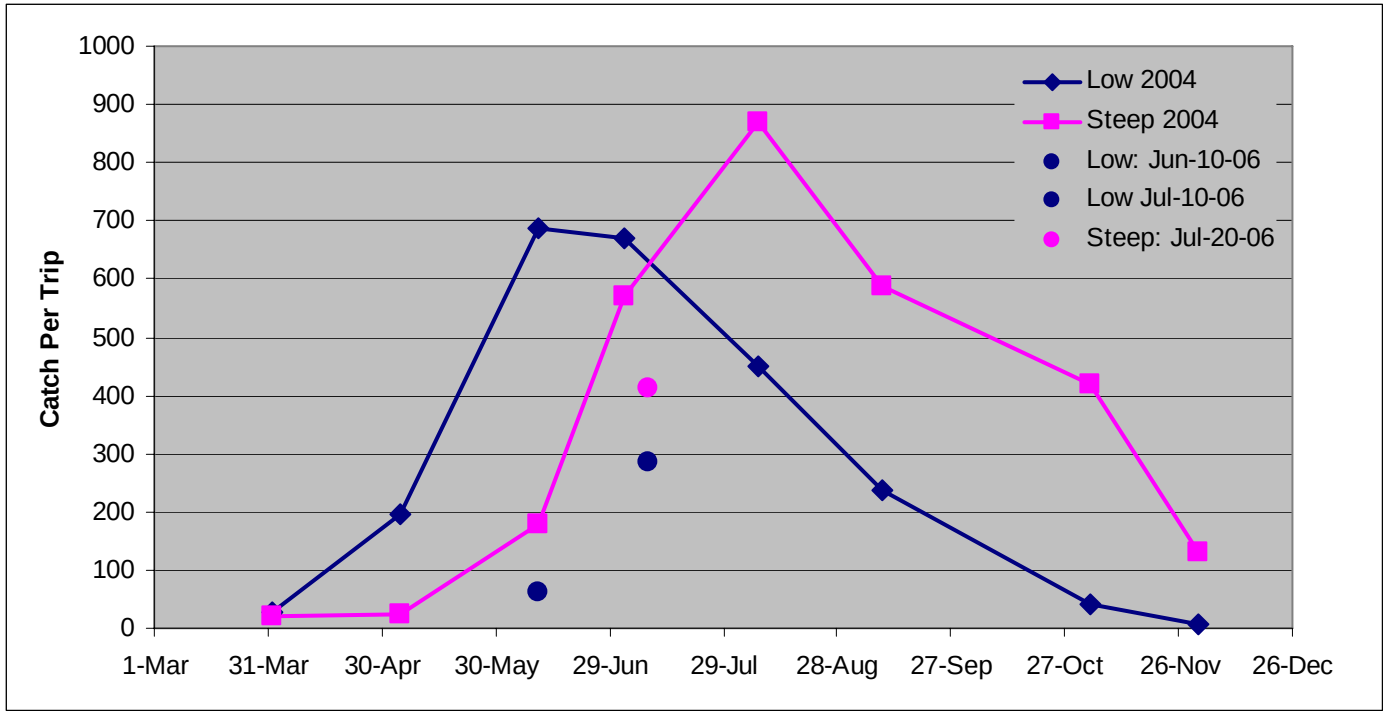


Figure 2. Mean condition factor (kn) for rainbow trout (RBT) by year at fixed
ferry 1991-2006, error bars = 2*SE).

Comparison of Fry Catches: 2004 vs. 2006

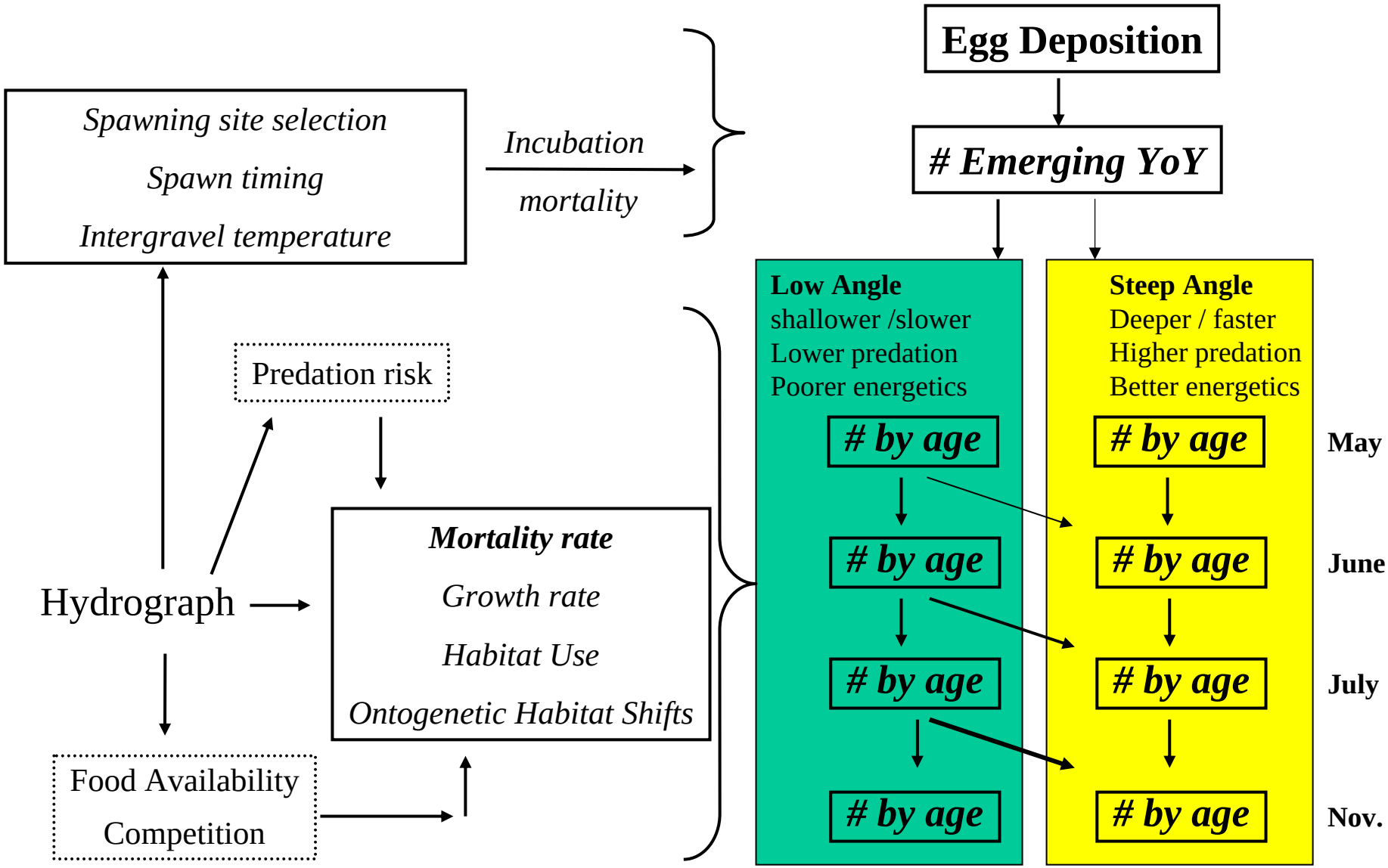


		Low	Steep
2006/2004 Ratio			
Spawn	0.04		
10-Jun		0.09	
9-Jul		0.43	0.72
Compensation Ratio			
10-Jun		2.21	?
9-Jul		8.5	14.4

Evaluation of 2003-2005 Jan-Mar. Experimental Flows Complicated by Compensatory Survival

		Egg Deposition	
		Low (06)	High (03/04) (07?)
GCD Impact On Incubation Survival	ROD (control) Low (06/07)		
	Experimental Moderate (03/04)		

Integrated Juvenile Stock Assessment Model Estimates Demographic Parameters that Determine Recruitment Rate to Adult Population



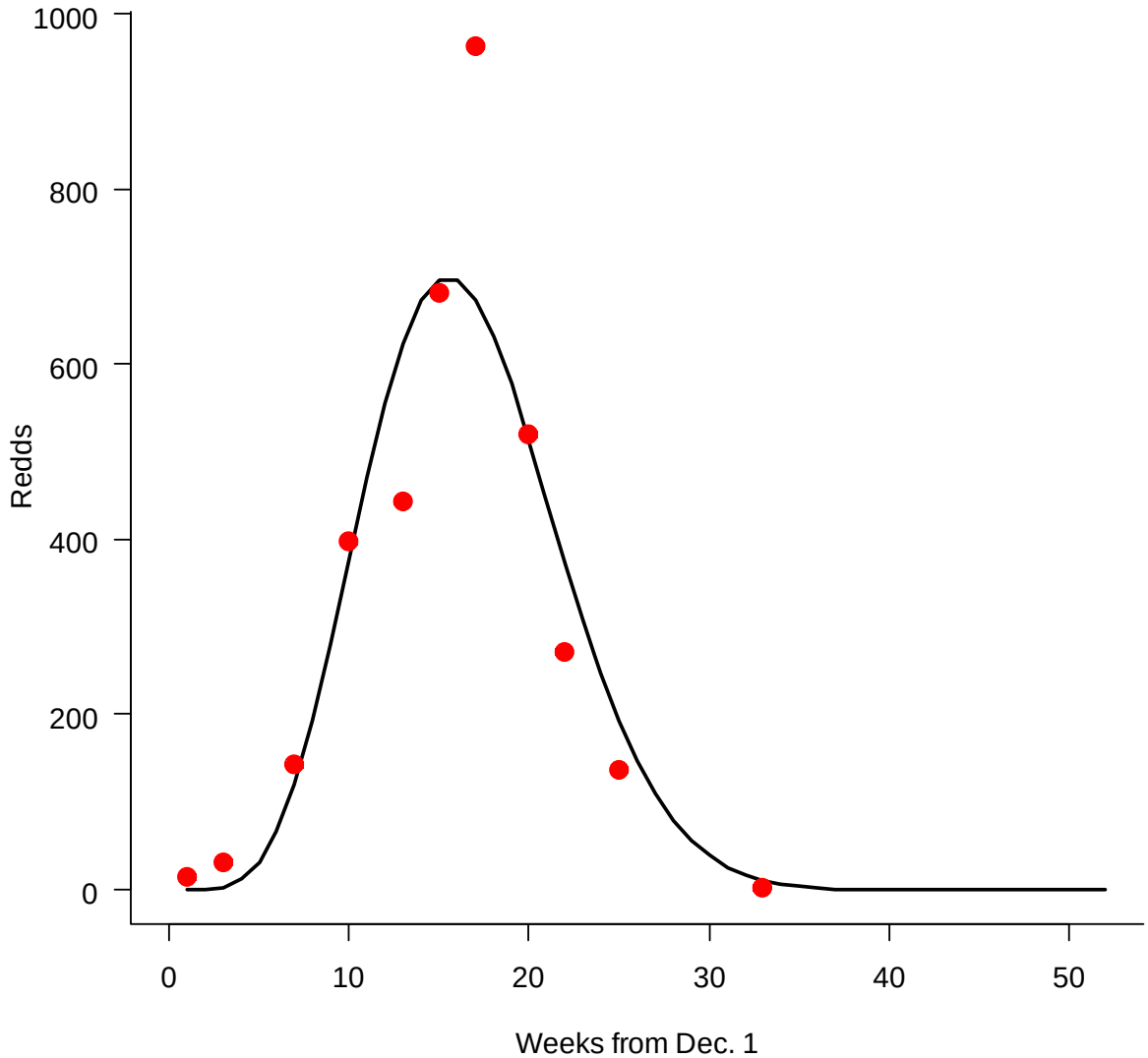
Data for Integrated Model

- Redd counts (Jan – Jun, monthly, every 2 wks near peak)
- Redd hypsometry and intergravel temperatures
  - Determines timing of hatch and predicts relative incubation survival
- Abundance of fry in low and steep angle habitats (monthly)
- Length-frequency in low and steep angle habitats (monthly)
- Length-at-age (otoliths)

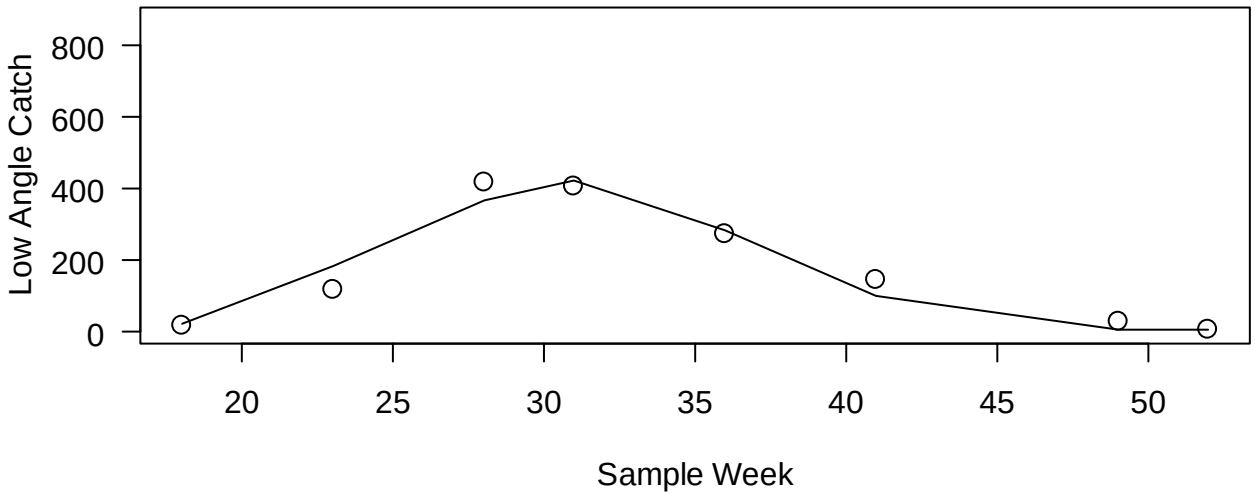
Integrated Model Estimates

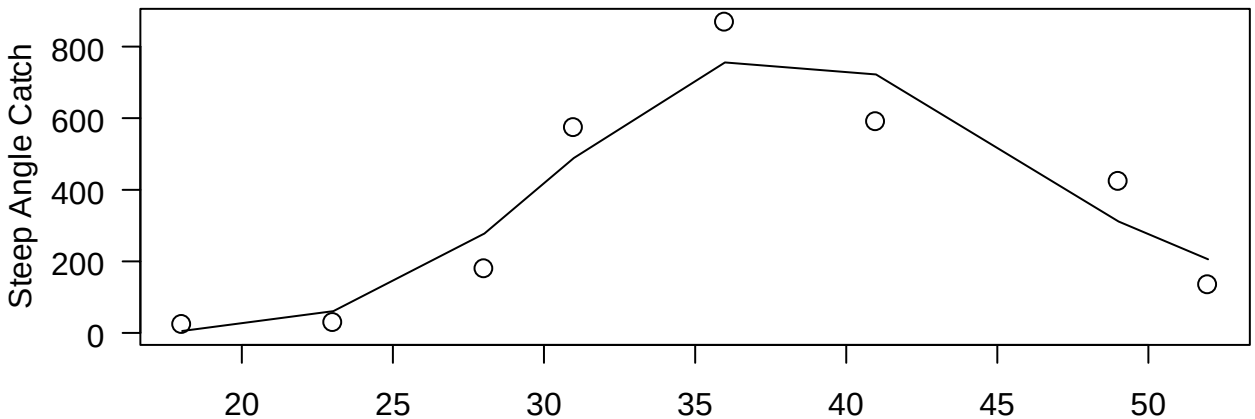
- Spawn magnitude (# redds) and timing
- Relative incubation survival rate (by year and season)
- Survival rate of fry from emergence to ca. 8 months
  - Annual or seasonal by habitat type
- Growth rate of fry
- Habitat use and movement
- Parameters of model are jointly estimated via maximum likelihood.
  - Most likely estimates
  - Confidence limits (posterior distributions)
  - How MLE's and confidence changes with increasingly complex models
  - Interaction of model parameters (confounding)

Integrated Assessment Model Fit to 2004 Data: Redd Counts

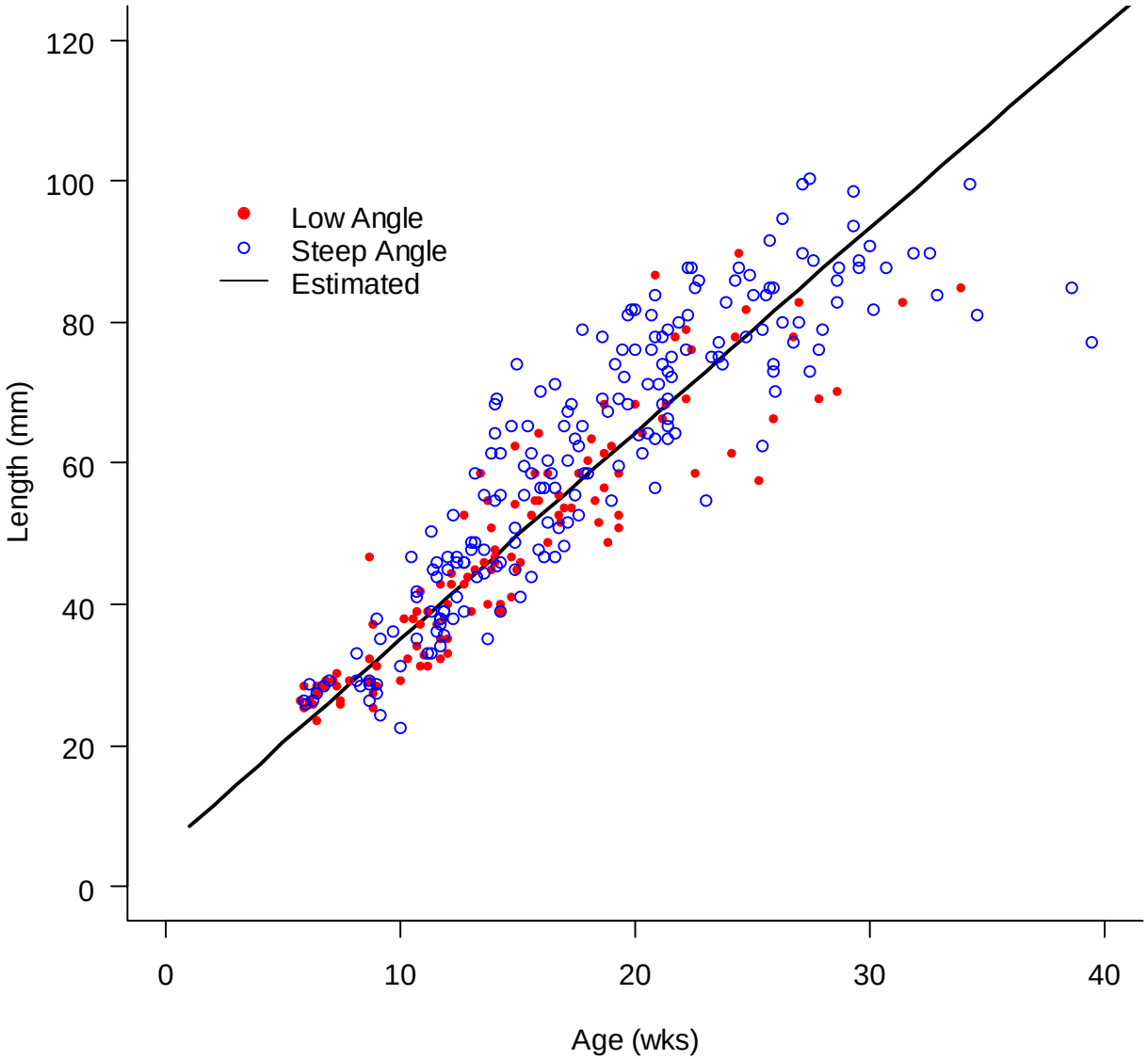


Integrated Assessment Model Fit to 2004 Data: Catch By Trip and Habitat Type

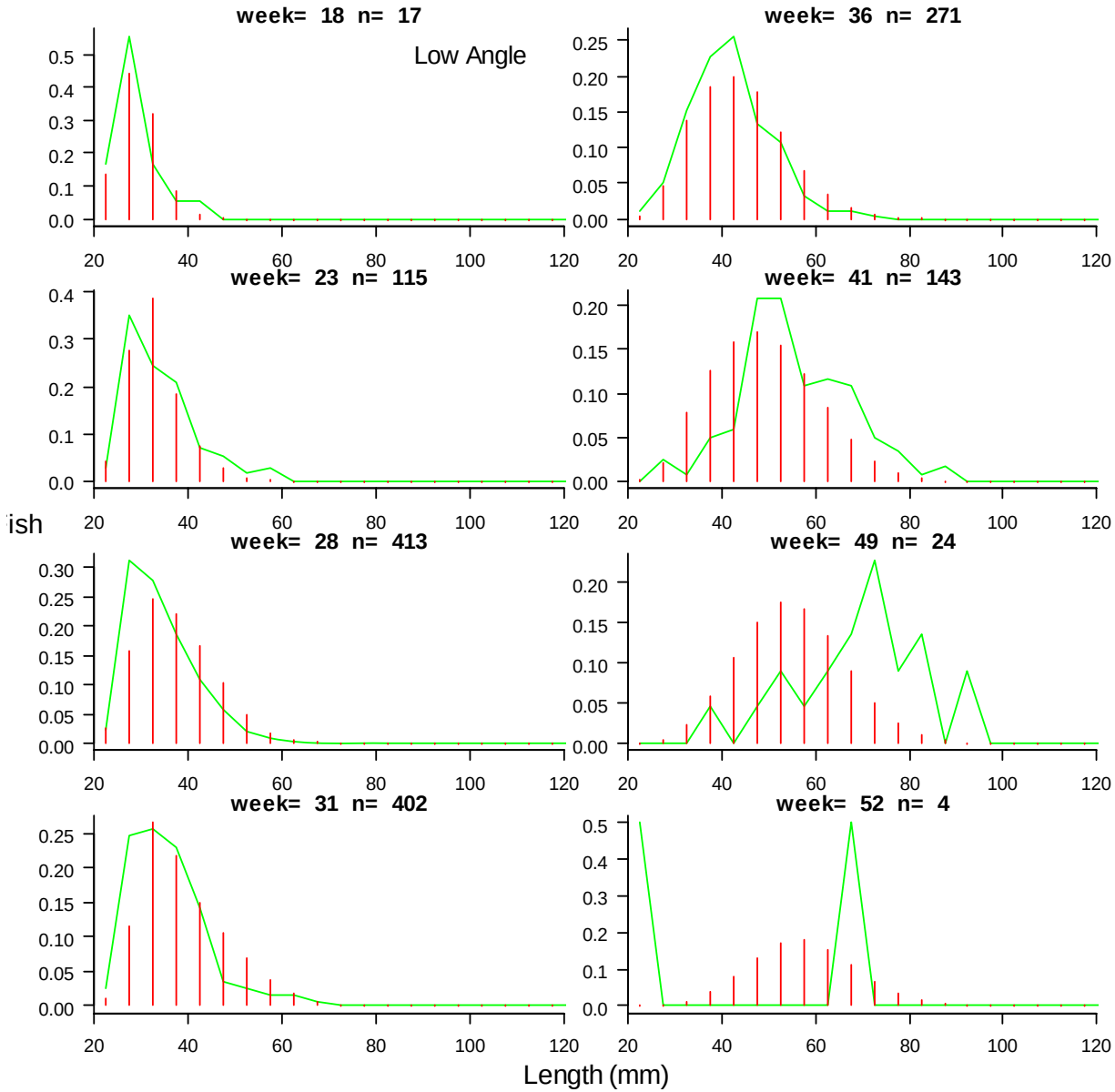




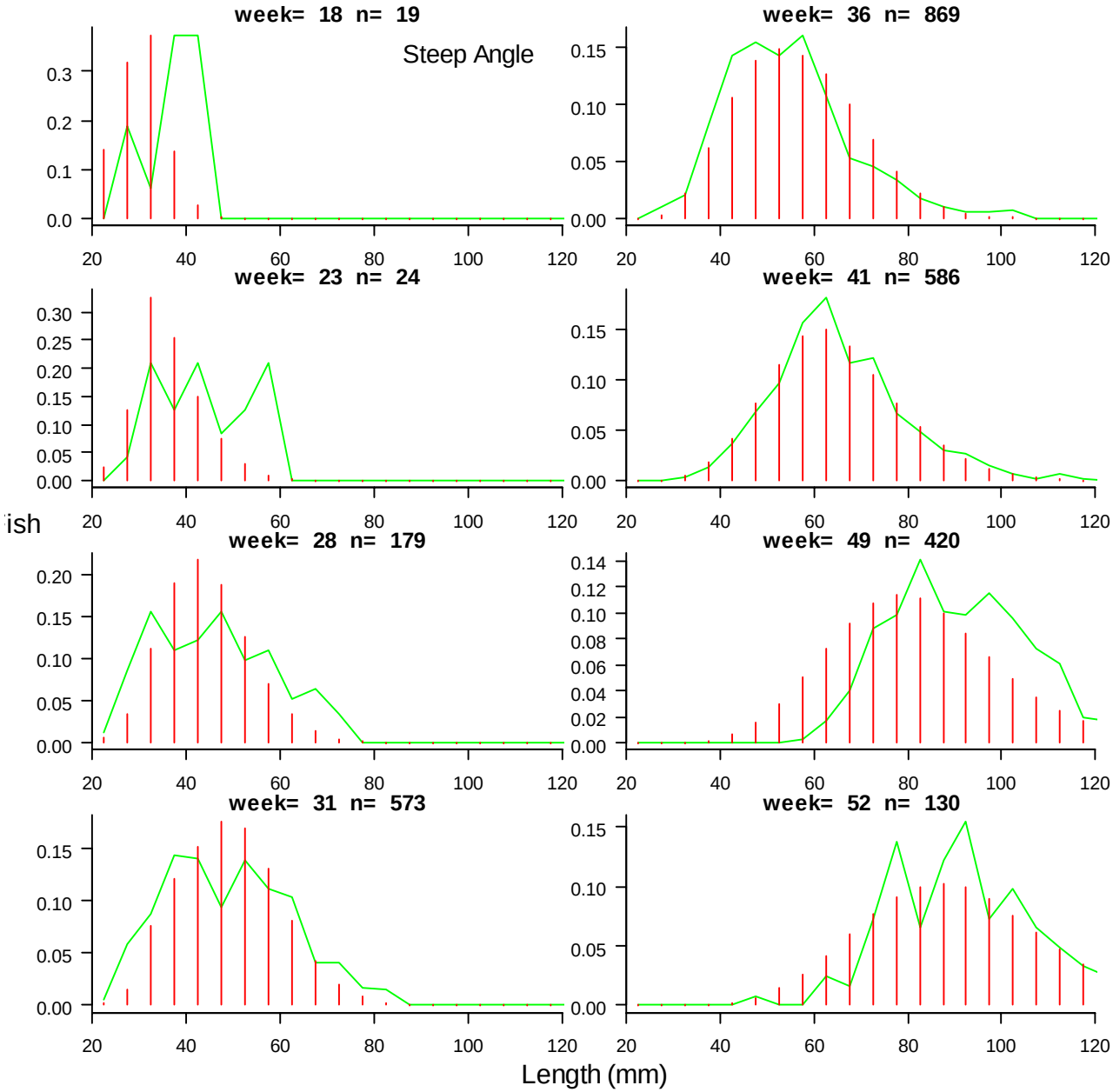
Integrated Assessment Model Fit to 2004 Data: Length-at-Age Otolith Data



Integrated Assessment Model: Fit to 2004 Data: Low Angle Proportions-by-Length



Integrated Assessment Model: Fit to 2004 Data: Steep Angle Proportions-by-Length



Utility of RTELSS Project

1. Original intent
   - Evaluation of 2003-2004 experimental flows on incubation survival. Age-0 monitoring used to verify model-based estimate of treatment effect

2. Potential to evaluate processes driving recruitment to adult population
   - Estimate annual and seasonal variation in age-0 mortality rates
     - High summertime daily fluctuations (10-18 kcfs)
     - Sept. min. flow change (10-18 kcfs to 5-10 kcfs)
     - 2004 flood
     - Sunday steady (2003) vs. unsteady (2004+) flows during summer
   - Evaluate compensatory growth and mortality response at low densities. 2006 data: stocking in 06 not necessary, reducing incubation survival possibly offset by strong compensation-target later life stage to regulate pop.)

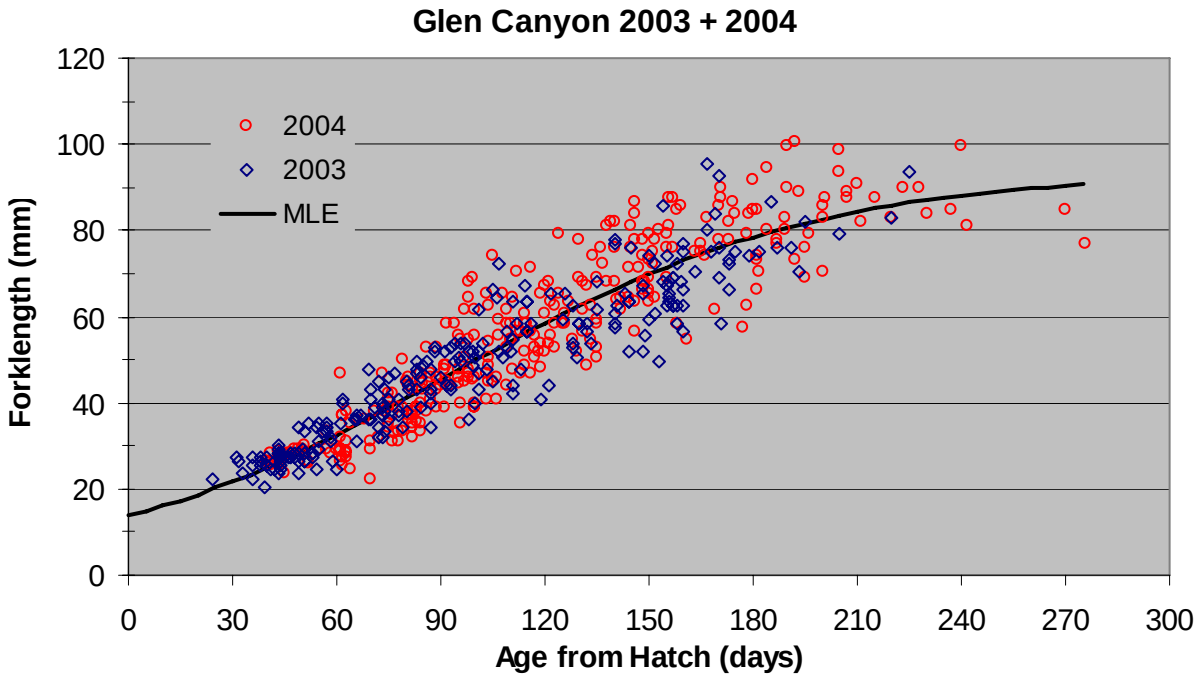
3. Long-Term monitoring of Lee's Ferry trout population to link GCD operations to changes in the abundance of adult population
   - Spawning intensity
   - Age-0 abundance
   - Annual and in-season incubation and Age-0 growth, survival, habitat use

4. Useful conceptual model for juvenile native fish studies (hypotheses and approaches)

Future Project Activities

- Complete FY06 proposed age-0 sampling (funded from FY06).
- Finalize integrated model and document model and results in primary literature (partially funded from FY06 budget).
- Review assessment at FY07 PEP:
  - Assessment of 03-05 experimental flows (?)
  - As a long-term monitoring strategy for Lee's Ferry trout. Use model to evaluate alternate designs (not funded).
- Field assessment of 2007 age-0 cohort (not funded).

Compensatory Growth Response to Low Densities



Have good age-length at high density to compare with low density

Fish size for July is bigger or same, but spawning is later. Suspect better growth. Need decent otolith sample size to evaluate.