

Development of Downstream Water Quality Model: Phase I

Proposal to DRD – Steering
Committee

From Bezzerides and Bestgen 2002 :

Status Review of Roundtail Chub *Gila Robusta*, Flannelmouth Sucker *Catostomus Latipinnis*, and Bluehead Sucker *Catostomus Discobolus*, in the Colorado River Basin

Regarding temperature and native warmwater fish...

- Tailwaters of bottom release dams are often too cold for successful reproduction
- Cooler water temps influence growth and survival of embryos and young fish.
- Larvae grow more slowly, increasing risk of predation and decreasing accumulation of reserves for overwinter survival .
- Larvae hatched in warm tributary streams may die from cold shock as they enter cold, mainstem channels, or ... become lethargic and vulnerable to predation .
- Growth rates and swimming performance of larval and juvenile fish may be reduced by cold water... lowering foraging efficiency and the ability to escape predators
- For adults: cold water temperatures may slow growth and reduce fecundity, ... decreasing chances for reproductive success

**Baseline Field Investigations,
Science-Based Opportunities
and
Potential Tools for
Improvement of the
Downstream Environment on
the
Lower Dolores River.**

**A Report Submitted to the
Colorado Water Conservation Board
in Fulfillment of the
2008/2009 Severance Tax Trust Fund
Grant Awarded to the Dolores River
Dialogue**

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**Modeling the Relationship
Between McPhee Dam Selective
Level Outlet Operations,
Downstream Algal Biomass,
Dissolved Oxygen and
Temperature:
Phase 1, Background Data and
Model Development.**

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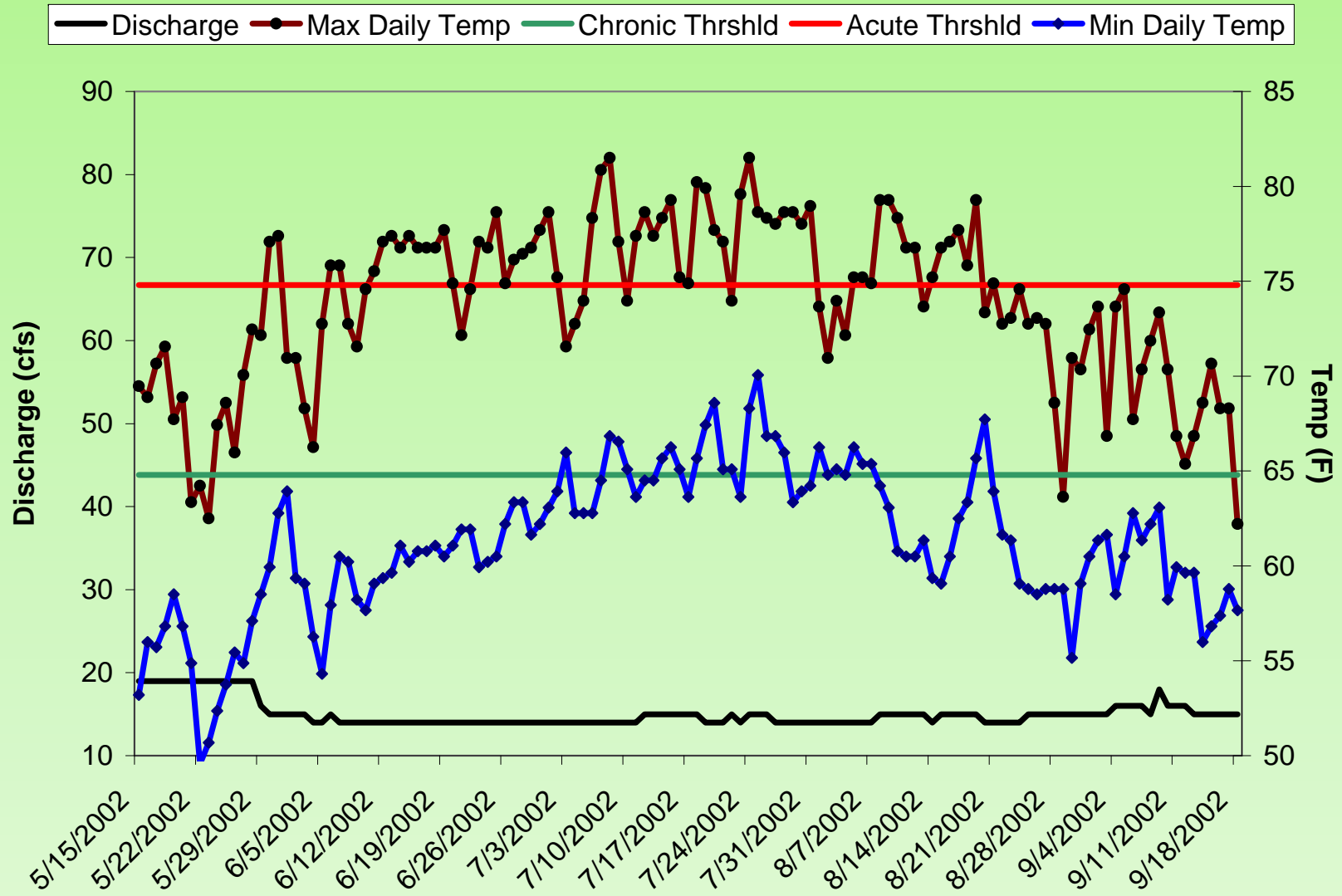
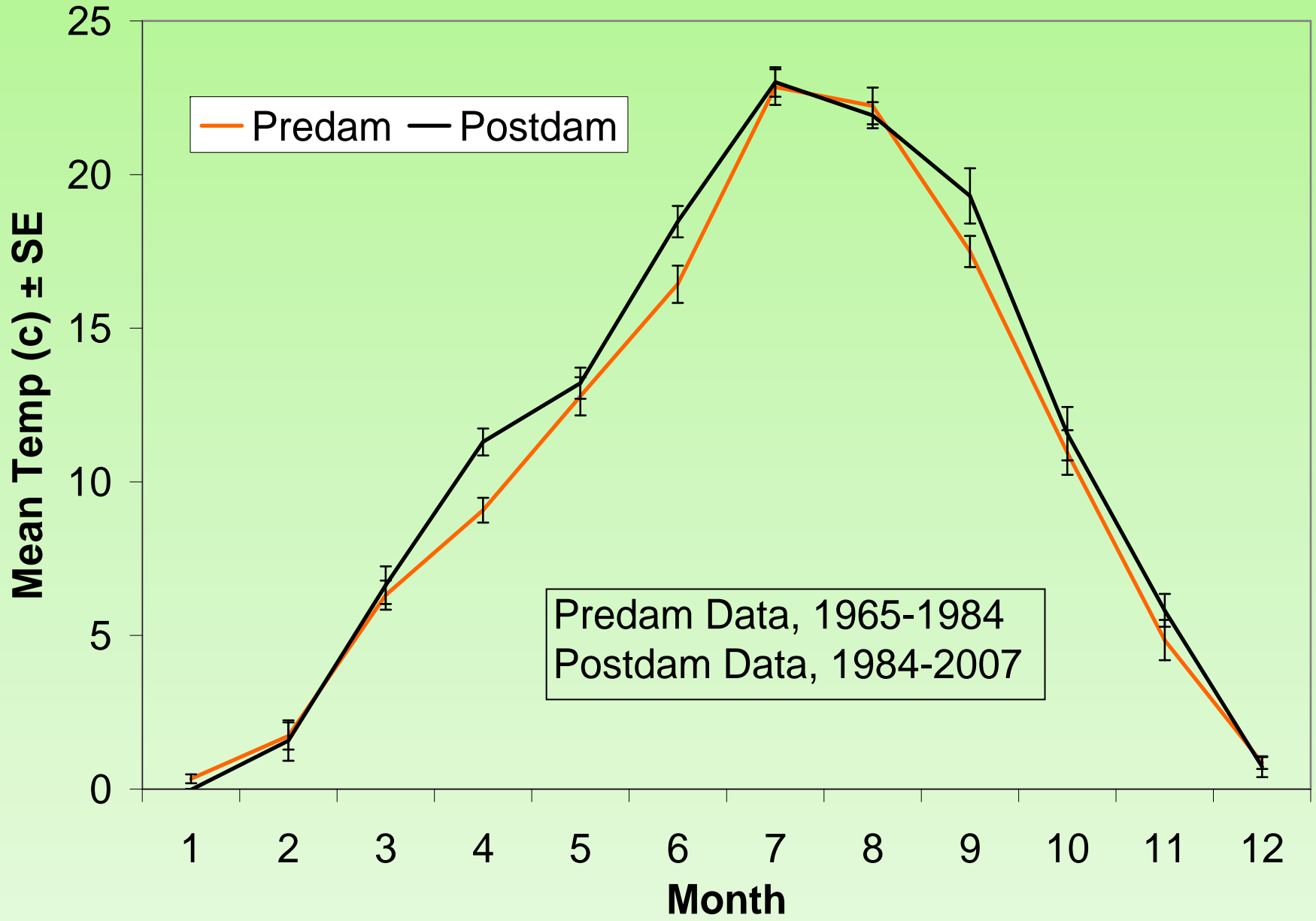


Figure 15. May through September daily maximum and minimum temperature and discharge data during the 2002 drought, measured at Bradfield Bridge. Note that the chronic temperature threshold for trout was exceeded several times for periods greater than 24 hours and the acute temperature threshold was exceeded on numerous occasions..



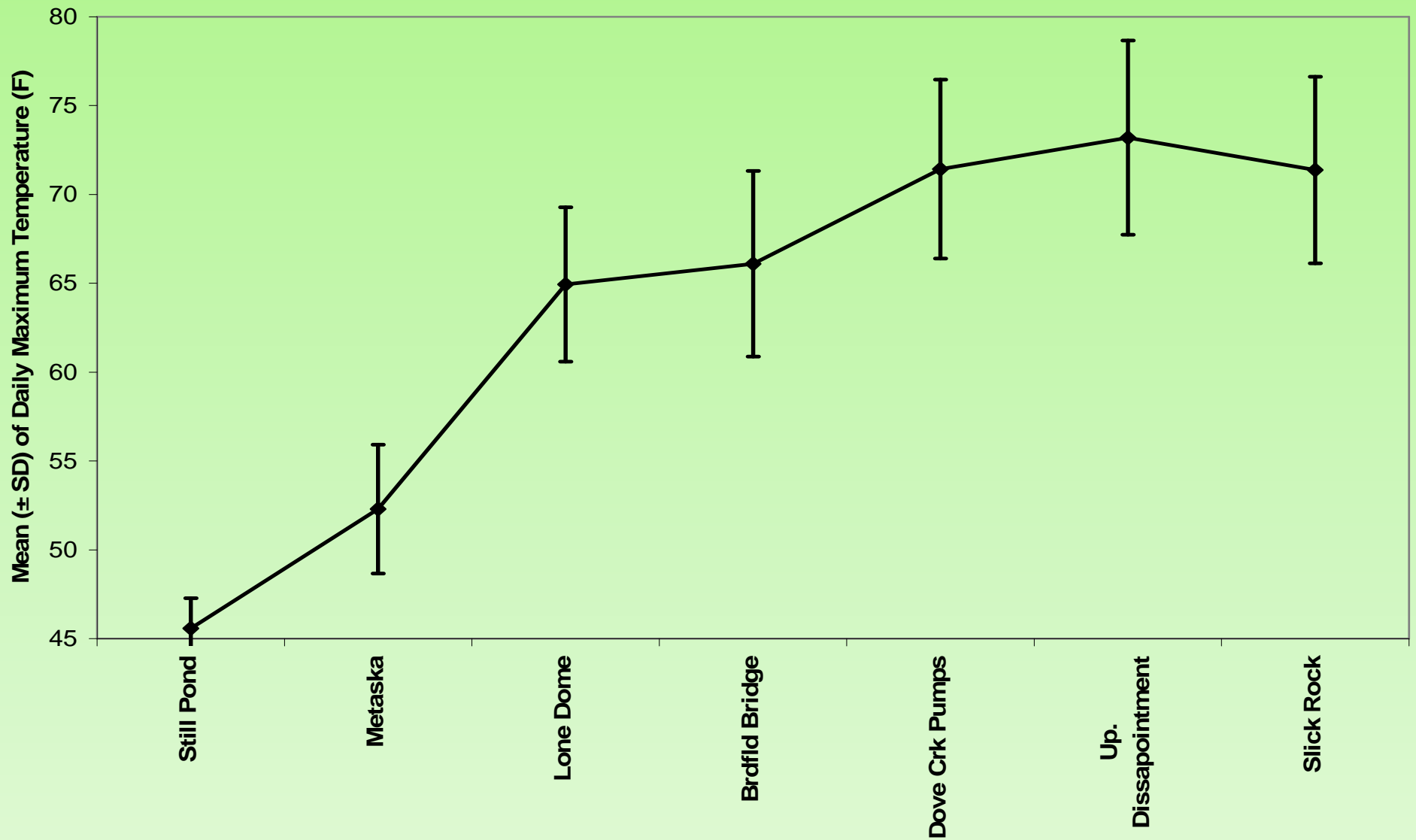


Figure 12. Mean \pm standard deviation of daily maximum temperature at 7 sites, McPhee dam downstream to Slick Rock. Ambient temperature is reached near Disappointment Creek where temperature of the water discharged from the dam has little influence on temperatures found in the river.

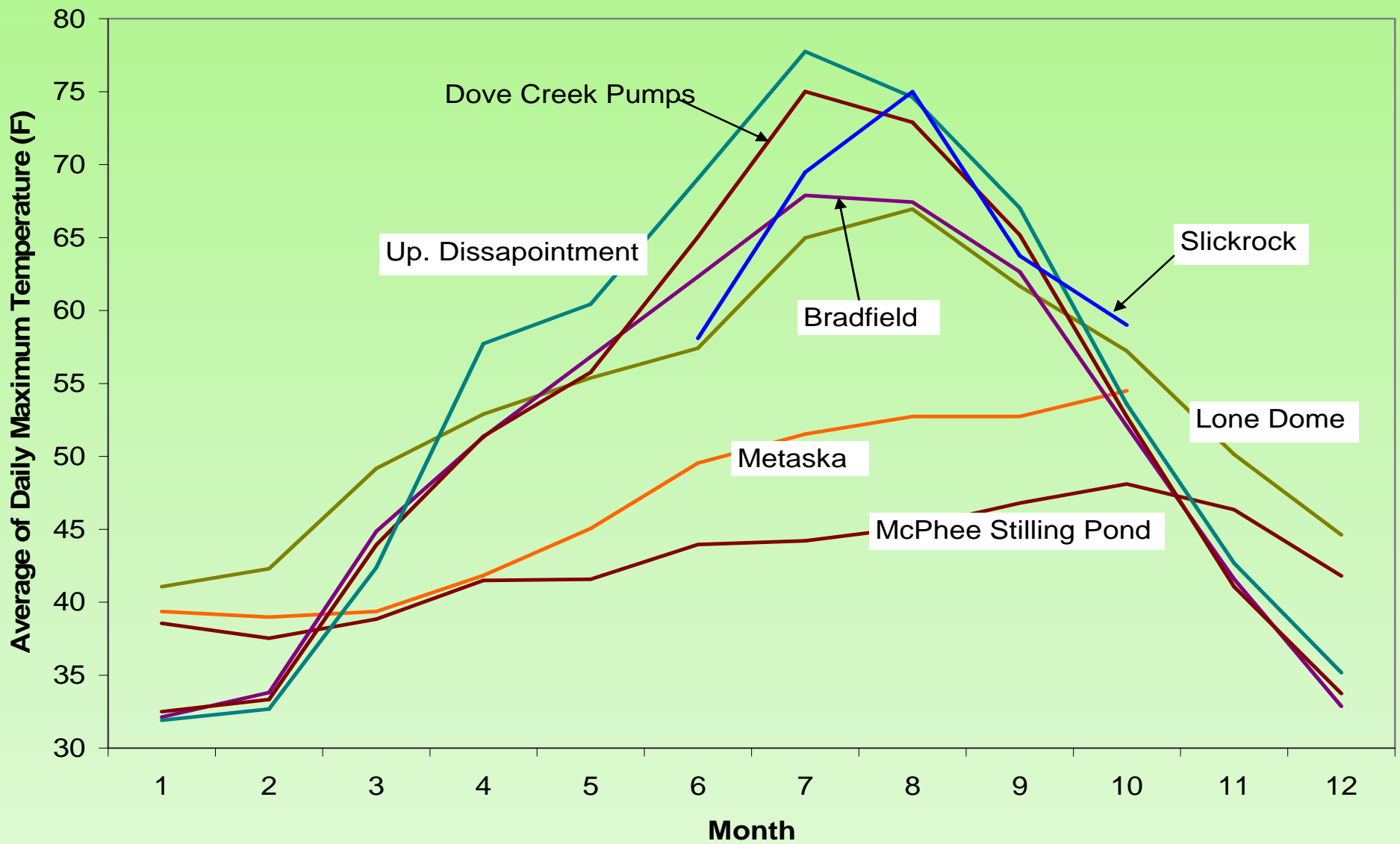


Figure 13. Average of daily maximum temperature at 7 sites, McPhee Dam downstream to Slickrock. Winter temperature upstream of Bradfield Bridge is greater than winter water temperature Bradfield Bridge downstream showing the influence of the dam in DRD Reach 1 (McPhee to Bradfield Bridge).

Lower Dolores Through the Lens of Temperature: Think like a fish!

McPhee to Bradfield:	cold water trout dominate
Bradfield Bridge to Dove Creek Pumps:	warm water natives and trout
Pyramid to Disappointment:	dominated by warm water non-natives, primarily small mouth bass, but also brown trout
Big Gypsum:	warm water species, native and non-native, with some brown trout
Slickrock Canyon:	warm water species, native and non-native

Downstream Water Quality Model

Predicts : H2O Temp at Location X (between dam and San Miguel)

As a function of:

- H2O Temp at discharge (based on “reservoir model”)
- Volume of discharge
- Air temp at location
- Date (i.e., angle of the sun)

