Streamgauging the Kissimmee River in Support to Ecosystem Restoration Efforts: Flow Rating by Index-Velocity in Pool C and its Uncertainty

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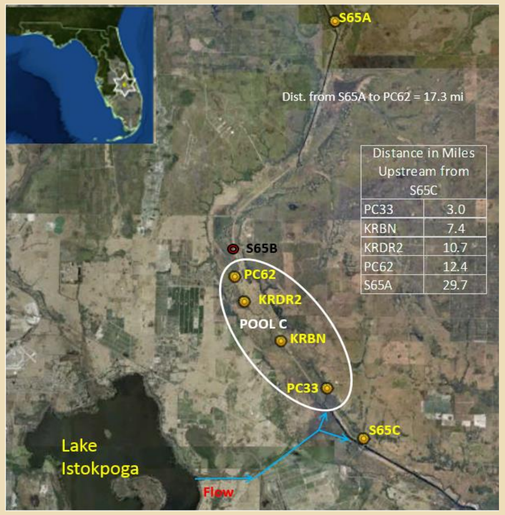
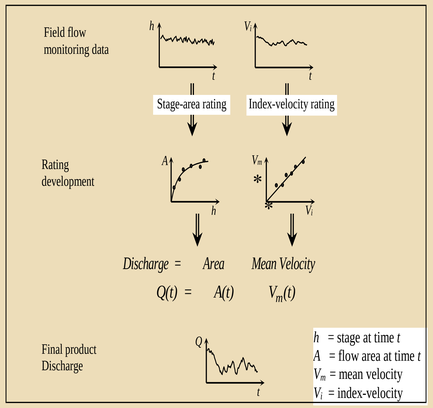
- The Kissimmee River Restoration Project called for reinstating the canal reach in Pool C between water control structure S65B (already removed) and S65C to its pre-channelization meandering path.
- The District (SFWMD) monitors the flow at PC33 and PC62 based on the Index-Velocity (IV) method.

Study Area

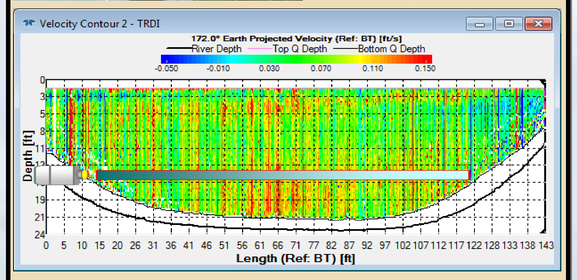


Flow Computed by the IV Method



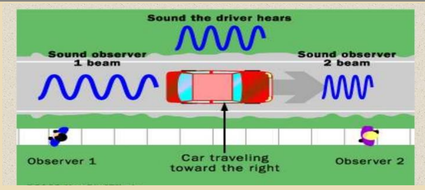
- Two site-specific ratings are required.
- Concurrent data collection with a fixed Index Velocity Meter and a boat-mounted ADCP
- Analysis of data and Development of two ratings
- 20 data sets were collected from June 2013-September 2014.

Water Velocity Data Collection



- Concurrent measurements of IV data and V_m data measured by an Acoustic Doppler Current Profiler (ADCP).
- IVs and ADCPs are acoustic meters that use the Doppler principle to measure water velocities.

How does the Doppler Principle Work?

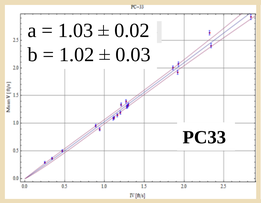


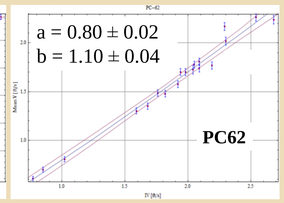
- In Radar technology the Doppler Effect measures an increase (or decrease) in frequency of sound, light, or other waves as the source and observer move toward (or away from) each other.
- IVs and ADCPs transmit sound pulses (F_0) and Receive back Doppler-shifted signals (F_D) to measure the water velocity

$F_D = 2\ F_0\ (V/C)$ V = Water Velocity C= Speed of Sound

Index Velocity Rating

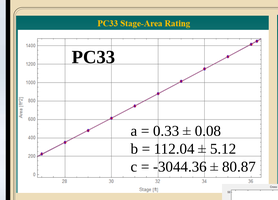
$$Vm = a(Vi)^b$$

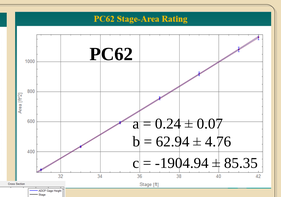


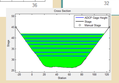


Stage-Area Rating

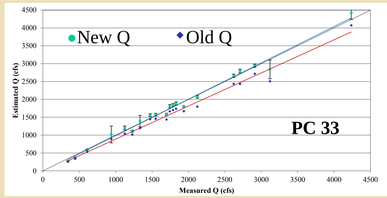
$$A = ah^2 + bh + c$$

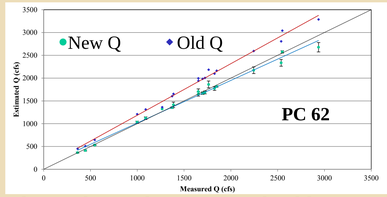




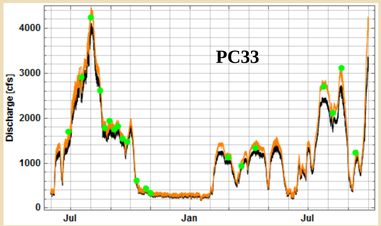


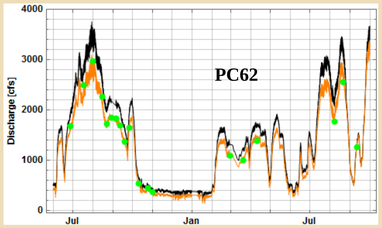
Old Versus New Ratings





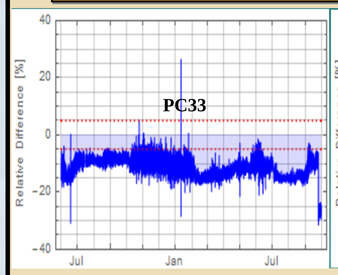
- Flows from the new and old ratings compared to ADCP measured discharges at PC33 and PC62.

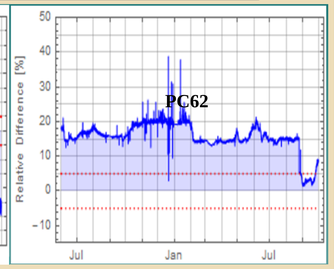


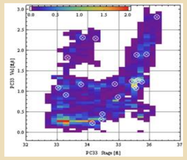


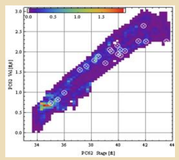
- Flow hydrographs estimated with the new rating (orange trace) and current rating in FLOW (black trace). ADCP measured streamgauging flow data are shown as green dots.

Impact and Frequency Analyses









Conclusions and Future Work

- The new ratings made use of the measurement uncertainty of the data as weights in the fitting to estimate the mean values of the rating parameters and their standard errors. This fitting approach provides ratings that yield more reliable estimates of flow data for performance evaluation of the restored Kissimmee River
- The rating procedure used here can be applied to other Index Velocity sites
- ADCP measurements are needed on a regular basis at Pool C to track morphological changes in the river that may trigger the need of IV rating revisions and updates

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