1. **Welcome, Introductions & Purpose of Science Forum** – Judy Ott, CHNEP
   Judy Ott called the Science Forum to order at 9:30 am & participants introduced themselves.
   Ms. Ott reviewed the purpose of the Science Forum: To identify appropriate metrics & performance measures for establishing Submerged Aquatic Vegetation Restoration (SAV) targets for the Tidal Caloosahatchee River. The outcomes will be presented to the next full TAC in February 2015 for consideration.

2. **Data Sources for Tidal Caloosahatchee River SAV**
   The morning session focused on existing SAV data sources for the Tidal Caloosahatchee River & included 6 presentations.

**Tidal Caloosahatchee Seagrass Mapping 1950-2008** — Judy Ott, CHNEP
- CHNEP includes 14 estuary regions from Dona/Roberts Bays south to Estero Bay.
- CHNEP contracted with Photo Science to create historical maps of seagrass, oyster, intertidal unvegetated habitats throughout the CHNEP estuary segments with 0.5 acre minimum mapping units, based on FLUCCS codes, including the Caloosahatchee up to the US 41 bridge, with + 215 acres of SAV in Tidal Caloosahatchee & 3,245 acres of SAV in San Carlos Bay.
- CHNEP also has FWRI 1982-1990 SAV aerial photos which showed ± 600 acres of SAV in Tidal Caloosahatchee & ±5,980 acres SAV in San Carlos Bay.
- CHNEP has Water Management District (WMD) 1999 SAV aerial photos which showed ± 2 acres SAV in Tidal Caloosahatchee & ± 3,715 acres SAV in San Carlos Bay.
- CHNEP has WMD 2008 SAV aerial photos which showed ± 300 acres SAV in Tidal Caloosahatchee & ± 2,470 acres SAV in San Carlos Bay.
- CHNEP has FWRI 2010 SAV aerial photos which show and undetermined number of acres of SAV in Tidal Caloosahatchee & San Carlos Bay.
- Sea level rise from 1965 – 2008 for the Fort Myers NOAA tide station was ±2.4 cm (±1”)/decade sea level rise.
- Sea level rise from 1999 – 2008 at FDEP seagrass transects in CHNEP was ±4.0 cm/decade.
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• Analysis of seagrass location change from 1950-1999 showed a small net decline & seagrasses migrated landward at both the deep & shoreward edges of seagrass beds in the most preserved areas of Charlotte Harbor.

• Analysis of seagrass location change from 1999 – 2008 showed a small net increase in seagrass acres & seagrasses expanded “up-river” in the Tidal Caloosahatchee River.

• Seagrass management considerations related to sea level rise include: a) continue monitoring & mapping SAV; b) continues using water quality targets based on seagrass light requirements for each estuary; c) re-evaluate contributions of water clarity & depth changes to water quality targets regularly; d) maintain & restore natural shorelines to allow landward migration of SAV with sea level rise; e) reduce pollutant loads to increase water clarity to maintain seagrass deep edge as sea level rise & development increase; & f) restore natural hydrology to accommodate changing rainfall patterns.

Tidal Caloosahatchee River SAV Mapping 1993 — Allen Hoffacker, Consulting Ecologist

• Field observations of Tidal Caloosahatchee SAV were made by Allen Hoffacker for Dexter Bender & Associates & recently transposed to GIS coverage by Tim Lieberman, SFWMD.

• 1993 field observations showed the presence of 4 species of SAV downstream from Franklin lock, including *Halodule*, *Thalassia*, *Ruppia* & *Vallisneria*.

• 1993 SAV density classifications in the Tidal Caloosahatchee River included scattered, moderate & dense.

• 1993 SAV acres in Tidal Caloosahatchee were estimated to be >2,012 acres.

SAV Research & Monitoring in the Caloosahatchee River & Estuary — Peter Doering, SWFWMD

• SFWMD SAV monitoring included manual in-water, hydroacoustic & aerial mapping.

• SFWMD SAV research included laboratory mesocosms, field & modeling.


• SFWMD monitors SAV at 9 locations from Beautiful Island to San Carlos Bay to Pine Island Sound.

• SAV monitor methods changed: sampling locations included random quadrats, quadrats on transects & quadrats in polygons; parameters included “old school” shoot counts, blade counts, blade lengths & biomass vs. “new school” % occurrence, visual % cover, canopy height & visual epiphyte density.

• A summary table of SAV monitoring locations & methods X year was provided.

• Hydro acoustic monitoring from 1996 – 2009 included 8 river reaches, 10 transects/reach, 3 times per year.

• Aerial photography & mapping was conducted by SFWMD in 1999, 2003, 2004, 2006, 2008 & 20014, but the Tidal Caloosahatchee was too dark with tannins for the aerial photography to be comprehensive.

• SAV research studies using were conducted by the Gumbo Limbo Lab for salinity tolerance (of *Vallisineria, Halodule, Thalassia* & *Syringodium*) & salinity/light interactions (*Vallisineria*) & by SCCF Lab for salinity/light/temperature interactions (*Vallisineria*).

• SAV research studies using field research were conducted on *Vallisineria* for transplanting (HBOI 1996-1997) & restoration pilot plantings (Conservancy of SWF 2003; SCCF 2008; FGCU 2011, 2012; Johnson Engineering 2014-2015).

• SAV Modeling was conducted for *Vallisineria* using the Hunt Model (shoots/sq m) & Buzzelli Model (grams C/sq m).

• Hunt Model for *Vallisineria* showed salinity is an important limiting factor in the upper Caloosahatchee estuary, with instance of light being important as well & more work is needed on temperature.

• A Color Dissolved Organic Matter (CDOM) was recently published by SFWMD evaluating the mixing behavior of CDOM & its potential ecological implication in the Caloosahatchee River Estuary; results for 11 stations & 3 parameters (color, *chl a* & turbidity) were provided.
MEETING NOTES

SCCF SAV Monitoring — Eric Milbrandt & Rick Bartleson, SCCF
- Before-After-Control-Impact (BACI) designs are often used to monitor potential environmental impacts.
- BACI designs are good for evaluating large & permanent potential changes after impact, protection against disasters & changes in mean conditions.
- BACI designs are poor for evaluating small & gradual changes, long term conditions & changes in variability.
- BACI designs monitor differential change between before/after/control/impact.
- SCCF conducted BACI monitoring at Blind Pass in Pine Island Sound before & after pass dredging of water quality, seagrass & fisheries.
- SCCF RECON water quality monitoring has control/impact stations at 13 sites from lower Caloosahatchee to San Carlos Bay to Pine Island Sound.
- SAV monitoring methods summary includes: measure shoot densities & % cover in parallel & perpendicular transects at impact & control sites; transects are measured at the beginning of the wet season & after river flows of 30 day average >1,500 cfs at S79.
- Monitoring results for salinity from 6/11 – 12/14 were provided at 3 locations.
- Monitoring results were provided for *Halodule* & *Thalassia* & *Syringodium* mean shoot density from 6/11 – 12/14, pre- & post- freshwater releases at S79, for 6 control & impact sites.
- Summary of analysis for the BACI analyses for 2013 data pre- & post- freshwater releases for *Halodule* or *Syringodium* densities showed no significant but for *Thalassia* showed greater densities pre- freshwater releases.
- Summary of regional data includes: aerial seagrass acreage estimates & status & trends & estimate of change – SAV in Pine Island Sound & San Carlos Bay have a small increase but declines in water quality & increases in prop scarring; with slight decreased density of *Thalassia* & *Halodule*.
- Conclusions of data show an initial rapid decline of SAV at sites near Shell Point & in San Carlos Bay in all species at onset of high flows; in addition – at control sites reduced leaf & shoot losses related to sun angle & day length also occurred.
- Annual discharges at S79 for 2014 (+20,000 million cubic ft) were less than all years since 2000 except 2007.
- Wet season discharges at S79 for 2013 (+85,000 million cubic ft) were greater than all years since 2007.
- Salinity contours for July 2013 showed <13 ppt in southern Matlacha Pass, San Carlos Bay & southern Pine Island Sound.
- SCCF RECON 2013 salinity data showed lower salinities in the lower Caloosahatchee Estuary in 2013.
- RECON 2014 & 2015 data will tell us how severe the low 2013 salinities were & whether the SAV will recover.

FDEP Caloosahatchee River Seagrass Monitoring Overview — Melynda Brown, FDEP
- FDEP monitors SAV at 6 sites in Tidal Caloosahatchee, San Carlos Bay & southern Matlacha Pass.
- Three sites in the Caloosahatchee River have been monitored consistently from 2007 – present; monitored 4 times a year, shore to deep edge, at beginning, end & repeated intermediate stations.
- Seagrass monitoring data collection uses the Braun Blanquet Abundance categories & includes: water depth, sediment type, SAV species composition & abundance, SAV blade lengths, total abundance, shoot counts & epiphyte type/density.
- Seven species of SAV were observed (*Caulerpa*, *Halodule*, *Halophila*, *Hydrilla*, *Ruppia*, *Thalassia* & *Vallisneria*), with *Halodule* comprising over 50% of the occurrences.
- SAV density (shoots/sq m) & deep edge varied by site, by year.
- In addition, there is older SAV data going back to 2000 at 17 sites in the Tidal Caloosahatchee, San Carlos Bay, southern Matlacha Pass & southern Pine Island Sound.
- A comparison of mean total abundance between rainy & dry season from 2000 – 2014 was provided.
- In addition, the FDEP Charlotte Harbor Aquatic Preserves monitors SAV at 50 sites annually since 1999 using similar methods & the results are published in the 2011 Watershed Summit Proceedings.

- “Patch Scale” SAV Monitoring in the Caloosahatchee Estuary – Why: SAV benefits humans & environment; is useful as an indicator of environmental health & human impacts; establish re-CERP reference conditions; determine SAV status & trends; detect unexpected responses of ecosystem to changes in stressors from CERP activities; support scientific investigations to increase understanding of ecosystems & cause/effect & unanticipated results.
- Where – 8 SAV beds in Caloosahatchee Estuary along salinity gradient (Vallisneria/Ruppia above Ft Myers, Halodule near Iona Cove, Halodule/Thalassia in San Carlos Bay), plus water quality monitoring in the same area.
- How – 20-30 sq m quadrats at each site, plus “quadzilla” 9 sq m quadrant at site 1 for 2013/2014 looking for Vallisneria.
- At each site, before 2009 quadrats were arranged in X pattern & starting in 2010 quadrats randomly placed in polygons.
- Collect shoots/sq m, grid counts, % cover & canopy height (only parameter collected every year since 1998).
- What has been learned – 1998-2014 is all “pre-CERP” but results, weather, climate, water management actions & other factors varied widely during the sampling period.
- From 1998-2014 monthly mean freshwater flows at S79 were often above or below the recommended envelope of 450-2,800 cfs.
- Salinity often exceed the Vallisneria tolerance of 10 psu in the upper estuary, except 2014 wasn’t too bad.
- Light penetration targets for SAV (+25% of Secchi depth) aren’t being met in upper & lower Caloosahatchee Estuary.
- In upper estuary, Vallisneria decimated by repeated high-salinity events with long lags in recovery.
- In middle estuary, little SAV found from 2002-2006 high flows but 2007 drought brought back sparse & seasonal Halodule.
- In lower estuary, Thalassia & Halodule present since data collected in 2004 in moderate & variable cover that shifts to Halodule after high flow events.
- Status & Trends – Upper estuary SAV poor with little or no recovery trend (Ruppia & Vallisneria scarce, sparse, short); Middle estuary SAV poor to fair with seasonal ups & downs since 2007 re-establishment; Lower estuary SAV fair & persistent with signs of stress & high seasonal & interannual variability in % cover & composition.
- Data used for status 7 trends – dominant species plots & representative underwater photography.
- It is too early to detect responses of SAV to CERP activities (none implemented yet) but SAV behavior raises other ecosystem questions, most importantly – what do we still need to figure out?

Seagrasses in Matlacha Pass: Ecological Baseline Survey of Cape Coral’s North Spreader Canal — James Douglas, FGCU

- 16 sites (1 hectare with 25 points) via 1 sq m quadrats (plus some 9 sq m quadrats) for % cover, SAV species & macroalgae monitored every 2 months starting July 2014.
- Species observed included: Syringodium, Thalassia, Halodule, Ruppia & macroalgae.
- Data was presented for each site for July/Aug. & Sept./Oct. sampling events for Halodule, Thalassia, Syringodium & macroalgae.
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- Summary: a) SAV are widespread but vary greatly in species composition, density, epiphytes & macroalgae abundance; b) SAV health seems generally better further north in Matlacha Pass; c) trend in species composition changes from north to south with a decrease in *Syringodium* & then *Thalassia*, with *Halodule* dominate south of Matlacha bridge; d) open water flats generally more dense SAV & more *Thalassia*; e) embayments had less, more variable SAV, dominated by *Halodule*; f) epiphytes & macroalgae found in both open water & embayment sites but only fully displaced SAV in embayments; g) comparison of SAV at control sites vs. spreader waterway breach sites showed high variation; h) *Syringodium* was only found at the northern control site; i) some control sites in embayments near shore near Matlacha were in poor condition, indicating degraded water quality in areas not directly related to the spreader canal.

3. Lunch Recess
The Science Forum recessed for lunch on site from 12:30 pm – 1:00 pm.

4. Existing CHNEP SAV Targets — Judy Ott, CHNEP
- SAV distribution in CHNEP varies by estuary, year, season & species; is the primary submerged habitat; comprises ±59.00 acres & is in estuarine waters < 2m deep.
- SAV declined over the long term (1950-1999) but have been relatively stable since 1982.
- Five species of SAV in CHNEP (*Halodule*, *Thalassia*, *Syringodium*, *Ruppia*, *Halophila* & *Vallisneria*).
- SAV targets are important because SAV is: widely distributed, quantifiable, a good environmental indicator, responsive to changes in water clarity, quantity, hydrology & salinity & can be sued to estimate needed pollutant load reductions & effectiveness of management activities.
- There is much SAV & water quality mapping & monitoring data available throughout CHNEP estuaries (aerial photos, SAV transects, CCHMN random sampling water quality, CHEVWQMN fixed water quality).
- Original CHNEP seagrass/water quality targets were developed in 2005 based on deep edge of seagrasses & estimated 25% SAV at deep edge & optical model of light attenuation (depending on CDOM, turbidity & *chl*).
- Revised CHNEP seagrass/water quality targets were develop in 2011 based on seagrass acreage persistence & light attenuation cumulative distribution frequency & associated *chl*, TP & TN targets needed to maintain & improve SAV.
- Revised targets also included a scoring system to estimate annual changes in conditions as stable, caution or degrading.
- Next steps for CHNEP SAV targets are: a) re-assess historic & current SAV conditions in tidal rivers & refine tidal river SAV targets; b) identify & implement pilot SAV restoration projects; c) continue seagrass monitoring & mapping; d) evaluate response of SAV to resource management actions regularly; e) implement projects to reduce pollutant loadings & restore natural hydrology; f) maintain & restore natural shorelines & hydrology to enhance SAV adaptation to sea level rise & climate change.

5. Factors Limiting Tidal Caloosahatchee River SAV
The next session focused on factors potentially limiting SAV distribution & included 2 presentations.

**Tape Grass, *Vallisneria*, Restoration in the Freshwater Caloosahatchee River** — Dave Ceilley, Johnson Engineering
- Ecosystem services of *Vallisneria* include habitat for fish & invertebrates, forage for manatees, freshwater turtles, fish waterfowl, crustaceans & snails, & stabilization of sediments, wave attenuations, improvement of water clarity & removal of nutrients.
- *Vallisneria* is found in north FL springs & rivers & south FL upper estuaries.
- *Vallisneria* is a good environmental indicator because: a) it tolerates oligohaline (< 10 ppt) conditions, natural fluctuations in water chemistry, sediments & nutrients; b) is important historically & is a Valued Ecosystem Component in the Caloosahatchee Ecosystem; c) once covered >1,000 acres in upper
MEETING NOTES

Caloosahatchee Estuary (Whiskey Cr to I-75; 1993); d) is sensitive to anthropogenic disturbances & extreme unnatural salinity regimes; e) can respond quickly to restored conditions.

- Factors controlling *Vallisneria* growth & distribution include: a) salinity levels & duration of exposure; b) water clarity, light attenuation & color; c) sediment type, nutrient concentrations & genetic strains; d) herbivory.

- SAV distribution in Caloosahatchee Estuary totaled >2,012 acres.

- From 1998 – 2013 both the salinity & the portion of the upper estuary supporting *Vallisneria* varied widely, with *Vallisneria* distribution peaking in 1998/1999 before falling to 0% in 2000, with only small recovery from 2004-2007 before falling to 0% again.


- SFWMD & FGCU conducted “small exclosure” *Vallisneria* restoration in Caloosahatchee River upstream from Franklin Locks (2011-2012) to: a) establish *Vallisneria* seed stock in upper Caloosahatchee; b) evaluate planting density; c) evaluate 2 local genetic strains for growth in Caloosahatchee; d) compare restoration in a protected oxbow with high organics to an open sandy shoreline.

- Invasive apple snail was a heavy herbivore during the study.

- “Large exclosures” were added at 12 new sites upstream from Franklin Locks.

- Salinity varied from 0.3 ppt – 0.5 ppt; Secchi varied from 0.6 m – 1.6 m; mean % cover varied from 935-100%; shoots/ sq m varied from 23 – 119 shoots/sq m.

- Study conclusions included: a) herbivory is controlling factor both upstream & downstream from Franklin Locks; b) mesh exclosures to protect *Vallisneria* from herbivory were critical to restoration success; c) exclosure cages (small & large) allowed for seed production; d) *Vallisneria* plants outside exclosures were grazed & short with no flowering or seed pods; e) growth habits of 2 strains were different (larger, fewer plants vs. smaller, more numerous plants)

- Problems encountered during the study included: a) damage to exclosures from vandalism & extreme waves; b) damage to exclosures from large wakes (>4’) from large vessels; c) herbivory by non-native apple snails; d) damage to cages & herbivory by manatees & freshwater turtles.

A Spectral Optical Model & an Updated Water Clarity Reporting Tool for Charlotte Harbor Seagrasses – presentation prepared by Kellie Dixon, Mote & presented by Judy Ott, CHNEP

- Seagrass protection depends on water clarity; water clarity depends on light attenuation; high color in CHNEP means a spectral model of light attenuation is needed; can use modeled light attenuation to evaluate water clarity trends.

- Field measurements of light attenuation measure all wavelengths of light together.

- Spectral model uses data for light attenuation for water, color, *chl*, turbidity at each wavelength (400 nm – 700 nm).

- Modeled light attenuation was compared to field-measured light attenuation & calibrated using data from throughout the CHNEP estuaries - resulting in an extremely close fit between modeled and observed data.

- Optical model allows water clarity to be calculated from measured color, *chl* & turbidity data & is good for measuring water clarity trends over time & responses to changes in watershed management activities.

- Modeled water clarity values for a reference period (2003-2007) were compared to seagrass targets for each estuary segment.

- Modeled values were used to determine if water quality trends are adequate to meet seagrass protection or restoration targets for each estuary.

- A “scoring” system was developed to convey trends in water clarity relative to seagrass protection targets showing improving, caution or declining conditions; the scoring system was slightly more strict for estuaries with seagrass restoration vs. protection targets to allow water clarity improvements needed for seagrass recovery.
The optical model values for the tidal Caloosahatchee River showed: a) as salinity decreases, color increases & % light available for seagrass growth decreases; b) in the upper estuary, a decrease in salinity from 15 ppt to 5 ppt resulted in a decrease in % photosynthetically active radiation (PAR) from 13% to 7%; c) in the lower estuary, a decrease in salinity from 25 ppt to 15 ppt resulted in a decrease in % PAR from 19% to 14%.

The next steps include: a) link the water clarity scoring & trends to measured seagrass performance; b) continue water clarity & quality monitoring; c) review model performance with future data.

6. Forum Participant Comments from Flip Charts — Forum Participants
Additional thoughts identified by Forum participants during the meeting on flip charts are summarized by topic below, in no order of importance.

Additional References, Data & Studies Needed:
- Studies of light attenuation effects of epiphytes & macrophytes on SAV.
- Studies of successful SAV restoration projects.
- Related studies known to local scientific community, including John Cassani.
- Studies of ecosystem services & fish habitat provided by SAV; contact Brad Robbins.
- Economic assessments of loss of SAV.
- Color (CDOM) & salinity data at Fort Myers since 1992.
- Bathymetry contours for Caloosahatchee River & Estuary.
- Bottom sediment conditions for the Caloosahatchee River & Estuary.
- Exclusion cages to protect SAV across a depth gradient of shallow–to-deep to determine deep edge of SAV growth in different zones of the Caloosahatchee River & Estuary.
- Identify refuge habitats for Vallisneria.
- Identify factors limit SAV growth & recovery.
- Evaluate economic impacts of loss of SAV.
- Location of chlorophyll maximum; conduct transects of chlorophyll concentrations across the river.
- Relationship of temperature to salinity to color under natural river flows vs. altered flows.
- Causes of lack of SAV recovery in upper & middle Caloosahatchee.
- The impacts of how SAV loss in the Caloosahatchee River & Estuary affect species of special concern &/or economic value &/or charisma.
- Minimum threshold for productivity (i.e.: shoots/m sq or geographic distribution.
- Definition of productivity based on ecosystem services, habitat, sediment, water quality.
- Inclusion of epiphytes with light limiting factors.
- Relationship of Lyngbia to light availability; Lyngbia is common worldwide as in indicator of disturbance.
- Better understanding of hysteresis — the lag behind causes & effects of SAV loss & recovery.
- Definition of what a healthy SAV system is in the Caloosahatchee River & Estuary.
- Minimum habitat conditions (sedimentation, nitrogen reduction, fish/invertebrate abundance) needed to provide ecosystem services.
- Better understanding of the relationship of color to residence time & how it affects SAV health.
- Better understanding of the relationship between color (CDOM) & salinity & flow & the difference the source of the water (river, tributaries, groundwater, S77 vs. S79) makes.
- Better understanding of how tidal bore will be affected by sea level rise, especially considering the restrictions on tidal flow cause by S70.

Factors Limiting SAV Distribution & Health:
- Water Clarity, amount of light & quality of light.
- Sediment movement.
- Extreme salinity changes.
- Herbivory.
- Seawalls in middle Caloosahatchee & wake refraction.
Potential SAV Metrics & Performance Measures for the Tidal Caloosahatchee River:

- 1993 Caloosahatchee SAV survey results overlaid on bathymetry contours.
- Set an MFL to protect *Vallisneria* upstream of US 41; suggest 600 acres; based on a 30 day moving average of 10 ppt salinity at Fort Myers.
- Include consideration of variability – seasonal, annual, interannual – with changes in water flow & effects of temperature, salinity & color on SAV recovery.
- Performance measures need to be independent of CERP implementation.
- Measure response to modeled vs. real flows & conditions.
- Require monitoring.
- Need to consider duration & frequency of low & high flow events as they cause extreme salinity events.
- Consider economic return for cost/benefit of restoration.
- SAV metrics should include: % cover, canopy height, acres, biomass.
- Use existing monitoring sites to evaluate BACI (before/after/control/impact) response.
- Use acres in productive condition as maintained by a number of factors (flow, color, salinity, etc.); measure as acres in 50-75% cover of SAV.
- Consider acres of SAV persistent over seasonal variation; acres with % cover maintained for a specific time & self-sustain for a specific time.
- Include above & below ground biomass (i.e. leaf & root growth/unit area/time).
- Consider presence/absence in % of suitable habitat.
- Consider habitat volume; define volume of specific salinity zone suitable for specific species (i.e. volume of low salinity zone suitable for *Vallisneria*).
- Measure SAV distribution & density by salinity zone.

Potential SAV Restoration Targets & Goals:

- The goal is to restore a highly managed system to a more natural, sustainable system.
- Use 1993 SAV distribution, acreage & species composition in Caloosahatchee River & Estuary as a Vision.
- Set a target as 50% of the 1993 distribution, acreage & species composition.
- Use the maximum depth of SAV growth & overlay it with bathymetry to determine the maximum area of SAV & set the target as some % of the maximum area.
- Identify the ideal SAV habitat by zone & establish acres with 50% of SAV.
- Restore sufficient acreage & locations of *Vallisneria* to be sustainable under heavy grazing by herbivores, including the manatee population that travels between the Orange River & San Carlos Bay.
- A minimum of 600 acres of fully functioning & seeding *Vallisneria*, as referenced in the MFL.
- Develop targets for the lower Caloosahatchee River based on the 1993 map & adopted SAV targets for San Carlos Bay.
- 1993 SAV distribution overlaid on 2.5 foot depth contour.
- 1960s *Vallisneria* distribution in the upper river.
- 600 acres of *Vallisneria* upstream from Beautiful Island.
- Based on monitoring, maintain appropriate species zones with special considerations of limiting factors.
- Manage tributaries as seed source, especially for *Vallisneria*.
- Based on the Vision, identify an envelope of salinity zones; revisit salinity maps during the wet & dry seasons.
- Base targets on productive SAV, not just presence.
- Include consideration of ecosystem services & fish habitat provided by SAV.
- Need defined geographic scopes & zones by species based on salinity values; suggest 600 acres of *Vallisneria* between Fort Myers & Beautiful Island.
- Use MFL to define salinity & SAV species zones.
- Include different SAV targets for upper (oligohaline), middle (mesohaline) & lower (euryhaline) zones of the Caloosahatchee River.
- Need to set targets for the upper river based on low flow conditions & in the lower river based on high flow conditions.
MEETING NOTES

- Could use *Vallisneria* in the upper river & oysters in the lower river as indicator species & set targets accordingly.
- Define how many acres of productive SAV habitat are needed in each zone.
- Need targets based on the minimum geographic distribution of species, minimum species density.
- Targets need to consider resiliency plus acres plus density.
- Targets need to reflect optimal & minimum conditions.
- Need targets for both east (upstream) & west (downstream) of US 41.
- Need to restore adequate acreage & quality of SAV to provide sustainable seed source.
- Base target on modeled acres in different zones based on a 30 day moving average salinity of 10 ppt salinity at Fort Myers & bathymetry & compare this to the 1993 SAV map.
- Need to restore sheet flow & natural surface hydrology & surface/ground water connections.
- Implement SAV restoration targets in 2 stages: restoration of SAV acres & restoration of flows to provide 10 ppt salinity in Fort Myers.
- Will need active SAV restoration (i.e. planting & herbivore exclusion) to augment natural recruitment & recovery.
- Set *Halodule* restoration targets in the lower river & *Vallisneria* restoration targets in the upper river.

Miscellaneous Thoughts:
- 1999 was the last year *Vallisneria* was observed to flower & was followed in 2001 by extremely large water releases through S79, then a couple of years of drought, so the *Vallisneria* wasn’t able to recover.
- Stabilize river flows to reduce extreme flow events & return salinity regime to more natural conditions to support SAV recovery & restoration.
- Require restoration monitoring.
- Gradually modify the temperature of the discharges from the FPL plant in the Orange River to redistribute manatees & reduce herbivory.
- 40 acres of SAV at 10% grazing/day by manatees would support 400 manatees.
- As algae populations increase, SAV decreases, turbidity increases & water clarity decreases.
- S79 is 12 miles downstream from the tidal influence in the river before dredging.
- Need to maintain oligohaline conditions in upper river to sustain full range of salinity gradient habitats downstream.
- Need to provide a seed source for *Vallisneria*.
- At high flows (2,000 cfs) salinity is 6 ppt at Iona; need to set mean monthly flows at S79 to provide 10 ppt at Fort Myers & 10-30 ppt at Cape Coral.
- Need to consider optimal flows in addition ot MFL & minimum flows.

Short & Long Term Next Steps:
- Compile existing SAV, water quality & water quantity monitoring sites & data for the Caloosahatchee River & Estuary onto 1 map & share with scientific community.
- Coordinate SAV & related water quality/quantity monitoring programs within the Caloosahatchee River & Estuary to ensure comprehensive coverage, continuity & longevity.
- Identify gaps in SAV, water quality & water quantity monitoring site geographical distribution & data.
- Work with partners to fill gaps in SAV, water quality & water quantity monitoring.
- Implement pilot & large scale SAV restoration projects in the Caloosahatchee River & Estuary, focusing on locations where the restoration is most likely to succeed.
- Celebrate successes in restoring SAV & water quality & water quantity in the Caloosahatchee River & Estuary.
- Estimate potential impacts of climate change, sea level rise & changes in rainfall patterns on flows, discharges & SAV.
- Quantify light attenuation effects of epiphytes & macrophytes on SAV distribution, abundance & species composition.
MEETING NOTES

- Compile additional scientific references about light attenuation effects of epiphytes & macrophytes on SAV & include in bibliography.
- Compile additional studies of successful SAV restoration projects, add them to the bibliography & share with the scientific community.
- Initiate a survey of scientific community to solicit ideas for SAV target restoration locations & metrics in the Caloosahatchee River & Estuary.
- Determine deep edge of Vallisneria growth in the Caloosahatchee River using exclusion cages & other methods.
- Conduct a follow-up CDOM (color dissolved organic matter) workshop to share knowledge learned since the previous CDOM workshop in 2007.
- Map existing SAV in the Caloosahatchee River & Estuary, including tributaries using scientifically sound methods.
- Identify policy & management changes needed to meet Minimum Flows & Levels (MFLs) & maximum flows for the Caloosahatchee River to meet SAV restoration needs.
- Seek additional local, state, federal & non-profit funding to implement SAV restoration in the Caloosahatchee River & Estuary.
- Up-date the CHNEP Water Quality Targets report to incorporate up-dated SAV Targets for the Caloosahatchee River & Estuary.
- Investigate solutions for reducing herbivory on SAV in the Caloosahatchee River & Estuary to a level that will support SAV recovery & restoration.
- Determine the suitability of planting Vallisneria in stormwater treatment areas.
- Evaluate groundwater trends & surface/groundwater interactions in the Caloosahatchee River & Estuary as it relates to SAV recovery & restoration.
- Investigate alternate SAV monitoring methods.
- Add ideas from this Tidal Caloosahatchee River SAV Targets Science Forum to the CHNEP Research Needs Inventory.

7. Short Term Next Steps Based on Forum Discussions — Judy Ott, CHNEP

- Add research needs identified at the Forum to CHNEP Research Needs Inventory.
- Develop & send survey of potential Caloosahatchee River & Estuary SAV restoration goals, targets & metrics to CHNEP TAC members, scientific community & partners.
- Compile existing SAV data sources.
- Convene working group to identify gaps in SAV monitoring & mapping locations, parameters, methods & frequencies.
- Convene working group to develop potential Caloosahatchee River & Estuary SAV goals, targets & metrics.
- Provide potential Caloosahatchee River & Estuary SAV goals, targets & metrics to CHNEP Management Conference for consideration.

8. Adjourn — Judy Ott, CHNEP

Ms. Ott adjourned the Science Forum at 4:30 pm.