

2014 Watershed Summit: Our Vision in Action

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Abstract The theme of the 2014 Charlotte Harbor National Estuary Program Watershed Summit was “Our Vision in Action.” The Charlotte Harbor National Estuary Program vision was developed through our partnerships and is featured in the adopted Comprehensive Conservation and Management Plan. The first Comprehensive Conservation and Management Plan was originally adopted in 2000. A vision section was added in 2008 and refined in 2013. Our overall vision is to restore altered hydrology, reverse water quality degradation, protect fish and wildlife habitat, and improve stewardship of natural resources. Our graphic vision was presented to the participants of the 2014 Watershed Summit. The participants used a technique called “Group Scoop” to identify the most significant accomplishments. The top four accomplishments in the Charlotte Harbor National Estuary Program’s 18-year history represent each of the four vision topics. They were:

1. Urban Fertilizer Ordinances, a water quality accomplishment
2. K-12 Outreach and Education, a stewardship accomplishment
3. Peaceful Horse Ranch acquisition, a fish and wildlife habitat accomplishment
4. Minimum Flows and Levels, a hydrology accomplishment.

Keywords Accomplishments, national estuary program, vision, watershed management

Background

National Estuary Programs (NEPs) were created under Section 320 of the Federal Clean Water Act. There are 28 in the United States and four in Florida. The Charlotte Harbor National Estuary Program (CHNEP) was designated in 1995 and is among the most recently designated. The Clean Water Act requires each NEP to convene a “Management Conference.” CHNEP’s Management Conference includes four committees, including one each for citizens, scientists/technicians, resource managers and elected/appointed officials. The Policy Committee consists of elected officials and top agency heads, and is the decision-making body of the CHNEP, which receives recommendations from each of the other three committees.

The Clean Water Act requires each NEP to adopt and implement a Comprehensive Conservation and Management Plan (CCMP). The CHNEP CCMP (CHNEP 2013) includes four priority problems, 15 quantifiable objectives and 64 priority actions. The priority problems include hydrologic alterations, water quality degradation, fish and wildlife habitat loss, and

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stewardship gaps. The CCMP is ambitious and requires CHNEP's broad partnerships to implement it. The 2014 Watershed Summit was used as an opportunity to identify the most significant achievements accomplished through CHNEP's partnership.

The CHNEP's 2014 Watershed Summit theme was "Our Vision in Action." The first session of the Summit was designed to highlight the conference theme. After the welcome, the audience was introduced to the "Our Vision in Action" game rules. The game was based on a game titled "Group Scoop" (Thiagarajan 2008). The summit participants were told that they were going to be shown the CCMP vision graphics. They were asked to think about the best action taken in the CHNEP area and write each idea on a five by eight inch index card. They were encouraged to generate as many ideas as possible. After the presentation of the CCMP vision graphics, audience members shared their ideas with individuals in neighboring seats. For each time neighbors shared their ideas, they were able to vote in favor of a single idea from among all of the ideas they discussed. They voted by signing the back of the index card with the action that they deemed the best.

As anticipated, audience members identified approximately 500 actions, many of the same actions individually. The final session of the Summit included a presentation of the "top ten" list of "Our Vision in Action." These were (in rank order):

1. Urban Fertilizer Ordinance
2. Kindergarten to 12th Grade High School (K-12) Outreach and Education
3. Peaceful Horse Ranch Land Acquisition
4. Minimum Flows and Levels (MFLs)
5. Stormwater Retrofits (Low Impact Development, sediment traps, etc.)
6. Expanding water quality monitoring partnerships
7. C-43 Reservoir on the Caloosahatchee River
8. Lake Okeechobee Regulation Schedule for flows of under 28,000 cfs
9. Lake Hancock Restoration Projects
10. Providing resources to Elected Officials and Policy makers.

The following sections describe the top four actions that have been accomplished to implement the CCMP. Each of the four actions identified at the Watershed Summit corresponds to a CCMP priority problem: Urban Fertilizer Ordinances (water quality), K-12 Outreach and Education (stewardship), Peaceful Horse Ranch Land Acquisition (fish and wildlife habitat), and Minimum Flows and Levels (hydrology).

Urban fertilizer ordinances. In 2007, the Southwest Florida Regional Planning Council (SWFRPC) adopted a series of resolutions designed to reduce urban water pollution. The first of these was #07-01 Fertilizer Resolution, adopted on March 15, 2007. It provided recommendations and guidelines to be considered by local government jurisdictions for the regulation and control of fertilizer application. The State of Florida followed this action

with the adoption of a Model Ordinance (FDEP 2010). There are several significant differences between the State Model and the SWFRPC resolution including higher maximum nitrogen application rates and no restricted application in the rainy season by the State model. The coastal cities and counties within the CHNEP study area all adopted the SWFRPC resolution guidelines in preference over the State model, with effective dates ranging between March 2007 and June 2012. Most jurisdictions in the CHNEP area had adopted an urban fertilizer ordinance by December 2008. Coastal counties and cities north of CHNEP adopted similar stricter ordinances. The expansion of Urban Fertilizer limitations were largely in response to the November 2008 Tampa Bay Model Regional Fertilizer Ordinance, Sierra Club outreach, and SWFRPC assistance. The coastal area between Pinellas and Lee Counties has uniformly adopted measures recommended in the SWFRPC resolution, with some (often stricter) variation in ordinance language.

The effect of the Southwest Florida urban fertilizer ordinances was evaluated using the Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network (CHEVWQMN). Volunteers collect water quality data the first Tuesday of each month at dawn. There are 51 fixed stations throughout the CHNEP estuarine study area. The data are all collected under the direction of the Florida Department of Environmental Protection (FDEP) using consistent Standard Operating Procedures (SOPs) and laboratory methods. Though data collection was initiated November 1996, collection of all parameters appears to have been implemented beginning August 1998. Because each site is managed by a volunteer, not all sites are visited through the period of record. Ten of the 51 sites were suppressed from the analysis because of inconsistent data collection between 2000 and 2015. The suppressed sites include two in Charlotte Harbor, three in Gasparilla Sound, three in Pine Island Sound and two in Estero Bay. The data collection period for pre-ordinance assessment was April 2000 through March 2007. The period for post-ordinance assessment was from April 2012 through March 2015. March 2015 was the last month of data available at the time of this analysis. Data from April 2007 to March 2012 were suppressed for the purposes of the analysis.

Several parameters were analyzed. Variables included pre- and post-adoption of all ordinances (pre/post), salinity, total phosphorus (TP), total nitrogen (TN), total Kjeldahl nitrogen (TKN, a measure of ammonia, ammonium and organic nitrogen) and fecal Coliform (fcoli). The variables were tested for correlation (Table 1). Furthermore, the variables were tested under a partial correlation, controlling for salinity (Table 2).

The Kendall's Tau B rank correlation coefficient test was used because water quality data are often not normally distributed. Two periods were compared: 1) the period before the urban fertilizer ordinances were adopted including April 2000 through March 2007 and 2) the period after nearly all the urban fertilizer ordinances were adopted including April 2012 through March 2015. The pre-ordinance included 2250 samples or more. The post-ordinance

Table 1. Kendall's Tau B correlation coefficients (r, two-tailed) for CHEVWQMN data (N = sample size) April 2000 through March 2007 and April 2012 through March 2015.

		Pre- Post	Salinity ppt	TP ugl	TN ugl	TKN ugl
Salinity ppt	r	-0.009	-			
	N	4091				
TP ugl	r	-0.070**	-0.370**	-		
	N	3575	3504			
TN ugl	r	-0.124**	-0.290**	0.303**	-	
	N	3449	3379	3441		
TKN ugl	r	-0.110**	-0.295**	0.325**	0.853**	-
	N	3523	3452	3515	3428	
Fcoli 100ml	r	0.160**	-0.237**	0.230**	0.162**	0.154**
	N	3749	3677	3542	3417	3489

** Significant at the 0.001 level

period had 1199 samples. No statistically significant differences in salinity were detected.

Total phosphorus, total nitrogen and total Kjeldahl nitrogen all had a statistically significant decrease between pre- and post-adoption of all ordinances. Fecal coliform had a statistically significant increase between pre- and post-adoption of all ordinances, even though fecal coliform had a positive statistically significant relationship with all measures of nutrients (total phosphorus, total nitrogen and total Kjeldahl nitrogen) which decreased. Therefore, decreases in septic system pollution or animal waste cannot be suggested as a cause for nutrient reductions in the estuaries. The use of Mann-Whitney U test confirms that the distribution of total phosphorus, total nitrogen and total Kjeldahl nitrogen between pre- and post-ordinance periods were significantly different at the 0.001 level, whereas the distribution of salinity was not.

Controlling for salinity, variables including total phosphorus, total nitrogen and total Kjeldahl nitrogen all had a statistically significant decrease between pre- and post-adoption of all ordinances. Fecal coliform had a statistically significant increase. Missing cases were excluded pairwise.

Table 2. Partial correlation (r), controlling for salinity for CHEVWQMN data (N = sample size) for April 2000 through March 2007 and April 2012 through March 2015.

		Pre- Post	TP ugl	TN ugl	TKN ugl
TP ugl	r	-0.068**	-		
	N	3501			
TN ugl	r	-0.141**	0.204**	-	
	N	3376	3376		
TKN ugl	r	-0.129**	0.197**	0.870**	-
	N	3449	3449	3376	
Fcoli 100ml	r	0.137**	0.031	0.011	0.001
	N	3674	3501	3376	3449

** Significant (2-tailed) at the 0.001 level

To verify that total phosphorous, total nitrogen and total Kjeldahl nitrogen were not declining prior to the adoption of urban fertilizer ordinances, trends within the pre-ordinance period were assessed using Kendall's Tau B rank correlation coefficient test. Over time, the period by year between April 2000 and March 2007, there was a statistically significant increase in total phosphorus, total nitrogen and total Kjeldahl nitrogen. Salinity decreased within the same period which would have explained the increase.

The adoption of Urban Fertilizer Ordinances by all eleven coastal city and county governments in the CHNEP study area represents tremendous cooperation. Florida House and Senate bills have been repeatedly introduced to preempt the local governments' ability to enforce ordinances more rigorous than the State model. Through the continued efforts of local elected officials and the local legislative delegations, municipal and county rights to control excess urban fertilizers remain in place so far. It appears that these actions have helped to decrease nutrient pollution in area estuaries.

K-12 education. Public information and education is a featured component of the CCMP, under the priority problem entitled "Stewardship Gaps." CHNEP provides a wide variety of programs through partnerships with the seven school districts, school programs such as Outdoor Classroom, non-profit organizations such as children's museums, individual teachers and individual students.

Partnerships with the seven school districts within the study area provides a cost effective way to reach the over 282,000 children enrolled in public school throughout the study area (FDOE 2013). The CHNEP works with each of its seven school districts to annually distribute their children's book, *Adventures in the Charlotte Harbor Watershed*, to every child at one grade level. For many of these children, this is the first book of their very own. Lee County School District created read-a-long videos with the author, a team of students, scientists and educators. Curriculum, coloring sheets, and a Spanish edition are a few of the additional resources CHNEP created. The program began in 2007 and is in its eighth year.

Each school year the CHNEP recognizes outstanding students whose work helps fulfill the program's CCMP at each of the five science fairs held in the study area. Two award-winning students presented their work at the 2014 Charlotte Harbor Watershed Summit poster session, along-side professional scientists.

School programs such as Outdoor Classroom and Environmental Education use CHNEP public outreach grants and micro-grants to augment their programs, providing students with creative and unique experiences that will improve their lifelong understanding of the natural world. For example, Harlem Heights Elementary Schools' Outdoor Classroom created an outdoor learning environment where fresh and salt waters mix in a mangrove forest. The Desoto County School District Outdoor Classroom used CHNEP grants to provide students the opportunity to travel to Charlotte Harbor to identify

wildlife habitats, test the water quality and write essays about their experience.

Individual teachers and students have sought CHNEP micro-grants to help make their creative and unique ideas a reality. For example, CHNEP supported the first printing of student Zander Srodes' *Turtle Talk Activity Book* in 2004, the Spanish version in 2006, and other turtle talk efforts. Mr. Srodes has gone on the international stage to continue his effort to protect endangered sea turtles.

CHNEP works with nonprofit organizations such as Lakes Education/Action Drive, Imaginarium, Explorations V Children's Museum, and others to develop exhibits, events, and games to teach about a wide variety of issues important to CHNEP and its CCMP. CHNEP supported WGPU public media through its *Curious Kids* programming.

This multi-prong approach has reached or will reach nearly every child in the public schools system in one or more methods.

Peaceful Horse Ranch land acquisition. The CHNEP CCMP calls for doubling the amount of conservation lands in the study area from 1998 acreages by 2025. Within the last 16 years, over 90 percent of this objective has been achieved. Though the 4,414-acre Peaceful Horse Ranch is not the largest of the acquisitions, it was cited as one of the greatest CCMP implementation accomplishments. Its position at the confluence of the Peace River and Horse Creek (along with buffers for 7.6 miles of the Peace River and 5.6 miles of Horse Creek) render it an important acquisition to protect Charlotte Harbor (FDEP 2014).

In addition, the acquisition has a remarkable history that intersects with long-standing concerns by CHNEP regarding phosphate mining permitting practices. In 2010, the Board of Trustees of the Internal Improvement Trust Fund added Peaceful Horse Ranch to the Florida Forever priority list in the newly designated Climate Change Lands category. A little over one year later, the Mosaic Company purchased Peaceful Horse Ranch at a bankruptcy auction to offer as part of a legal settlement with Sierra Club, the People for the Protection of the Peace River and Manasota 88 over the South Fort Meade phosphate mining permit. However, FDEP refused to accept the property for management (Pittman 2013). The terms of the agreement said that if FDEP did not accept it, the property would go to the Conservancy of Southwest Florida. The Conservancy of Southwest Florida successfully facilitated transfer of the property to the Board of Trustees of the Internal Improvement Trust Fund with the Florida Department of Agriculture and Consumer Services (FDACS) Florida Forest Service as the management agency. Florida Commissioner of Agriculture Adam H. Putnam described the donation as important to protect "Florida's beautiful landscape and wildlife corridor, while creating new opportunities for recreational activities and agricultural operations" (FDACS 2014).

CHNEP (2011) stated that almost 14 percent of the CHNEP's landmass is under conservation management, but the Peace River basin has the least percentage under conservation management at 7 percent. The CHNEP CCMP

Vision shows acquisition of a buffer for the Peace River and its tributaries as one of the largest unserved conservation needs. The transfer of the Peaceful Horse Ranch is an important step in the assembly of the buffer. The phosphate industry's role toward this significant step is notable. The Peaceful Horse Ranch land acquisition represents the first off-site acquisition and restoration project associated with a phosphate mining permit application within the Peace River basin. Subsequent off-site protection and restoration opportunities have been incorporated into the first Peace River Basin phosphate mining permit applications as of 2014.

Minimum Flows and Levels. As the CHNEP was developing its first CCMP, the water management districts were developing their first adopted Minimum Flows and Levels (MFLs) to limit withdrawals that “would be significantly harmful to the water resources or ecology of the area” (State of Florida 2015). Consequently, MFL development by our water management district partners with review by the CHNEP partnership was featured within the hydrologic alteration problem area of the CCMP. Within the CHNEP watershed, MFLs have been adopted for the Peace River (Upper, Middle, and Lower), Myakka River (Upper and Lower), and the Caloosahatchee River and Estuary. In addition, MFLs have been proposed for Dona Bay/Shakett Creek below Cow Pen Slough and adopted for lower west coast aquifers.

MFL adoption has been valuable because 1) quantitative standards provide the public with a simple tool to determine if flows are adequate or if there is a problem; 2) MFLs have been developed with the best scientific information available, peer review and public comment; and 3) failure to meet adopted MFLs has prompted projects and policies which are improving flows.

Based on the statute language, the first technical issue is the definition of “significant harm.” Throughout Southwest Florida Water Management District (SFWMD) documentation, a 15 percent change in habitat availability compared to estuarine baseline conditions has been the designated threshold for “significant harm.”

South Florida Water Management District (SFWMD) documentation states that significant harm is “harm that requires multiple years for the water resource to recover” (SFWMD 2000). For the Caloosahatchee River and Estuary, analysis of valued ecosystem components and other key species requirements formed a picture of general flow needs. SFWMD then proposed MFL criteria for the Caloosahatchee River and Estuary based on maintaining the wild celery/tape grass (*Vallisneria americana*) using a hydrologic model, a salinity model, and a *Vallisneria* growth model. The MFL is exceeded when the 30-day average salinity concentration exceeds 10 parts per thousand or the daily average salinity exceeds a concentration of 20 parts per thousand at the Ft. Myers salinity station. This corresponds roughly to a mean monthly flow of 300 cfs at S-79, otherwise known as the Franklin Locks. Douglass (2014) confirms 450 cfs flow at S-79 is the lower limit for maintaining *Vallisneria*

habitat and 2800 cfs is the upper limit for maintaining *Halodule wrightii* habitat in the Caloosahatchee estuary.

The Franklin Lock (S-79) was constructed on the Caloosahatchee River in 1966. The year 2014 is the first year since construction that average monthly flows fell within the envelope of 450 to 2800 cfs. (Appendix) presents average monthly flow collected at S-79 from USGS station 2292900 beginning in 1966. In 2014, the lowest mean monthly flow was 613 in May and the highest mean monthly flow was 2730 cfs in September. The low and high average monthly flows are within the salinity targets defined by SFWMD based on valued ecosystem components and other key species requirements. The dispersed water storage projects in the Kissimmee River Basin created 51,400 acre-feet of retention and storage on public and private land by the end of fiscal year 2014 contributing to this success. In addition, the Lake Okeechobee Regulation Schedule adopted in 2008 (USACOE 2008) provides policy tools to help meet MFLs.

MFLs have prompted actions by the SFWMD. The Lake Hancock Lake Level Modification Project (construction completed in 2015) is expected to provide approximately 50 percent of the minimum flow requirements for a 20-mile portion of river, protect thousands of acres of floodplain and reduce nitrogen levels by 27 percent (SFWMD 2007).

Adoption of MFLs has prompted projects and policies to ensure natural systems receive adequate water. They provide clear criteria that communicate to citizens, scientists and elected officials the state of hydrologic flow to the rivers and estuaries.

Summary and Conclusions

The participants at the 2014 Watershed Summit identified 10 significant achievements of the Charlotte Harbor National Estuary Program (CHNEP) and its partners toward implementing the Comprehensive Conservation and Management Plan (CCMP.) The top four selected address one of each of the four priority problems areas of the CCMP, including water quality degradation, hydrologic alteration, fish and wildlife habitat loss, and stewardship gaps. It appears that each selected accomplishment incorporates a wide variety of related actions. The adoption of Minimum Flows and Levels (MFLs) provides citizens and resource managers with tools to evaluate hydrologic flows and select resource management policies and projects to meet the MFL targets. Urban Fertilizer Ordinances involved cooperation of all eleven coastal local governments as well as neighboring governments to apply a consistent improved treatment of residential and commercial fertilizer application. A key land acquisition project demonstrated a way to achieve CCMP goals in concert with phosphate mine permitting. Environmental education geared to K-12 not only reaches that age bracket but also their families and friends.

Environmental restoration of a seven-county CHNEP watershed requires the unified but independent actions of citizens and government. These efforts represent our "Vision in Action."

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Month

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1966					2,241	4,853	5,636	6,350	4,371	2,954	742	117
1967	121	198	88	10	10	1,300	2,145	1,714	798	1,411	109	10
1968	38	59	42	10	547	5,622	7,169	4,631	1,073	1,346	901	479
1969	211	158	4,558	2,106	2,634	5,008	2,145	4,153	1,465	6,772	6,869	4,789
1970	7,486	5,245	8,829	7,970	1,574	5,371	5,050	1,857	624	459	98	10
1971	25	61	56	10	113	274	993	1,084	2,411	1,234	357	86
1972	31	109	33	119	57	1,458	546	228	370	85	369	195
1973	223	592	395	134	10	548	1,645	2,537	2,603	762	29	104
1974	20	21	10	18	154	1,940	7,376	10,751	5,248	311	64	212
1975	25	10	201	175	318	855	1,745	705	1,917	942	62	21
1976	56	460	236	192	342	627	688	1,637	1,035	188	135	39
1977	527	133	92	135	782	773	767	1,173	1,550	105	90	747
1978	308	204	715	62	485	817	1,855	4,063	1,758	643	235	455
1979	4,088	4,172	3,033	84	915	192	363	340	4,408	5,937	1,217	1,171
1980	2,506	4,561	3,106	3,297	1,700	613	529	1,178	1,823	177	248	46
1981	30	267	144	81	106	253	81	901	1,238	4,892	33	4
1982	3	28	67	194	686	6,053	3,510	3,158	1,992	4,892	176	240
1983	2,060	10,079	10,321	8,198	2,473	2,923	1,331	2,455	2,925	2,657	741	831
1984	941	1,889	5,536	5,830	1,537	3,336	6,264	4,079	1,526	528	777	259
1985	323	48	294	458	480	983	1,985	2,376	3,687	922	156	130
1986	343	84	1,228	15	181	2,917	2,528	4,209	2,286	723	863	514
1987	1,659	937	1,921	1,909	1,012	600	1,412	1,229	1,442	2,792	4,488	980
1988	576	1,269	2,223	804	136	362	1,648	2,895	1,113	111	680	187
1989	199	351	531	722	46	700	1,397	1,491	1,538	987	30	197
1990	68	479	6	396	91	439	1,453	2,567	799	663	26	10
1991	1,010	185	57	371	1,426	1,732	3,989	3,114	1,653	1,287	233	89
1992	98	486	428	474	159	3,657	3,084	3,676	2,628	654	182	74
1993	2,400	2,891	1,434	3,268	178	946	763	1,489	3,778	2,698	618	108
1994	626	855	394	447	207	1,945	1,549	1,853	4,869	4,835	3,910	5,519

Appendix Continued

Year	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1995	5,406	3,819	2,681	1,274	124	1,731	3,394	8,287	9,357	10,391	6,785	2,708
1996	2,348	331	267	1,017	696	4,304	3,813	1,012	389	1,037	24	272
1997	68	472	250	458	357	832	1,401	2,500	2,009	884	394	2,952
1998	5,632	8,296	10,156	6,291	2,095	477	821	3,195	2,759	1,105	2,578	296
1999	665	98	7	780	301	3,601	3,185	2,739	3,961	4,853	4,170	1,779
2000	809	17	342	1,351	2,914	494	992	486	1,816	798	148	0
2001	154	0	30	32	126	474	2,115	2,999	5,599	1,657	447	311
2002	490	454	693	245	431	3,753	5,441	2,795	5,024	1,709	766	2,816
2003	3,870	1,887	738	714	1,958	5,904	3,591	7,469	8,962	4,692	1,369	1,695
2004	1,651	1,902	902	642	267	700	582	4,040	5,518	9,356	4,435	963
2005	1,401	1,183	2,820	2,683	3,410	9,096	10,928	8,847	4,983	4,087	9,187	5,903
2006	769	1,558	1,146	1,028	625	625	1,039	2,816	5,495	71	17	265
2007	238	253	0	0	0	218	255	171	312	84	7	43
2008	59	43	36	124	0	330	1,516	5,780	4,744	1,709	416	535
2009	635	468	150	271	735	1,937	3,551	2,766	2,572	205	137	569
2010	462	542	2,137	2,824	4,758	3,352	4,872	2,503	1,366	292	504	277
2011	211	318	256	49	29	234	1,056	1,829	1,681	2,153	1,027	318
2012	459	483	369	284	497	663	961	2,546	3,948	5,047	1,070	729
2013	691	1,162	759	764	1,328	3,777	10,145	10,654	7,711	2,961	778	715
2014	679	1,099	1,131	762	613	854	1,567	2,171	2,730	1,499	1,086	1,342