New Jersey STATE of the SHORE REPORT 2006

Managing New Jersey's Coastal Growth in the 21st Century

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The New Jersey Marine Sciences Consortium (NJMSC) and its partners are pleased to present the 2006 State of the Shore Report, which is produced annually and presented prior to Memorial Day weekend to the press and public at a special pre-summer press event.

The Nation's coastal counties; i.e., counties with at least 15% of their land area in a coastal watershed, and extending out to the edge of the continental shelf, contribute nearly one-half of the US Gross Domestic Product (GNP), or $4.5 *trillion*. New Jersey's coastal economy is no exception, and what we report here has as much application in our state as elsewhere on the globe. Unfortunately, this great coastal economic engine does not come without costs. More than ever, increasing coastal populations, land use practices, and advanced technology threaten the long-term sustainability of ocean and coastal resources.

To address this issue, the U.S. Commission on Ocean Policy has called for prioritizing uses, minimizing conflicts, protecting resources, and ensuring that uses are compatible. Balance is called for in terms of long and short-term strategies, as is the need for decentralization in decision making. "Ecosystem-based" management pervades the Ocean Commission report as a means to bridge geographic boundaries, place humans in the coastal landscape, and focus on multiple activities (and uses) occurring within areas that are defined by ecological rather than political boundaries. Yet despite the plethora of recent recommendations for managing the coastal zone and reversing decades of abuse and degradation, decision makers and the public have yet to confront the real issue:

> Where multiple desirable but competing objectives exist, it is not possible to maximize each…[and] in any system with multiple competing objectives it will not be possible to meet every one
>
> *U.S. Commission on Ocean Policy 2004*

The compromises and sacrifices that will be required to accommodate human needs while preserving ecosystem functions; i.e., how we achieve balance in meeting the demands of competing uses is the great challenge of the 21st century.

PERHAPS ALL IS NOT LOST. Although the problems that face global sustainability are doubtless huge - imperfect science, the inability to accurately predict outcomes, the complexity of natural systems, the relationship between acquired wealth and overexploitation of resources, the effects of natural variability and uncertainty on our ability to predict the consequences of our actions, techno-arrogance, and human population growth – it does not seem any less arrogant to assume we are unable to assert any control over our destiny.

PROGRESS IS BEING MADE. In reporting on the outcome of the National Research Council's Board on Sustainable Development, the authors noted "some major historical trends and transitions have occurred that might significantly affect the prospects for sustainability over the next half century." But they also warn that current global and regional trends may make sustainability transition more difficult as well as more feasible. Among the trends of note were the observations that 1) a global transition in birth rates tending toward zero is occurring ultimately offering an upper bound to human needs; 2) the observation that many regions of the globe have witnessed a dramatic growth in per capita domestic product; with wealth comes the ability to meet human needs; 3) industrialized countries now exhibit the largest decrease in harmful consumption per unit value of product, but unfortunately, increases in the worldwide consumption of energy and other natural resources currently offset the gains; and 4) the recent transition of energy sources and transmission, new materials and the substitution of information for energy and materials are all technologies that continue long-term processes of decarbonization, dematerialization and detoxification.

THERE ARE NO EASY FIXES. But at least we can strive for better balance in the managing of human dominated ecosystems. Current management practices appear to be weighted towards preserving natural functions, decoupled from system reliability. In human dominated systems, however, they should be redirected towards goals and mandates to rehabilitate the functions associated with service reliability. Critical to any new approach is the realization that management goals should include both elements of ecology and commerce, proportional to human dominance in the landscape. Our fate rests in the human dimensions of societal action vested in all stakeholders, consensus building in the context of conflict resolution, and the compromises and sacrifices that will ensure environmental and social justice for all.

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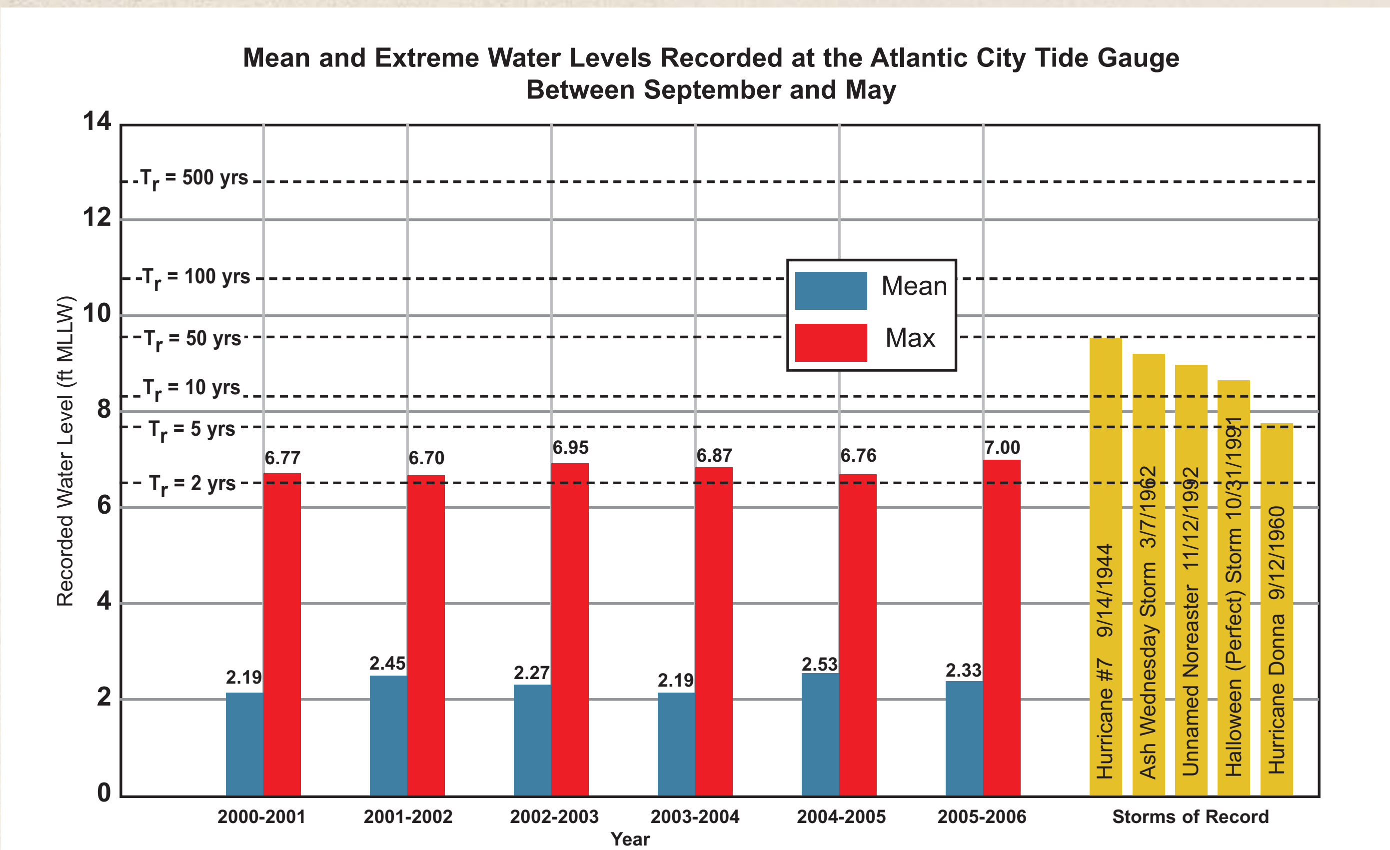
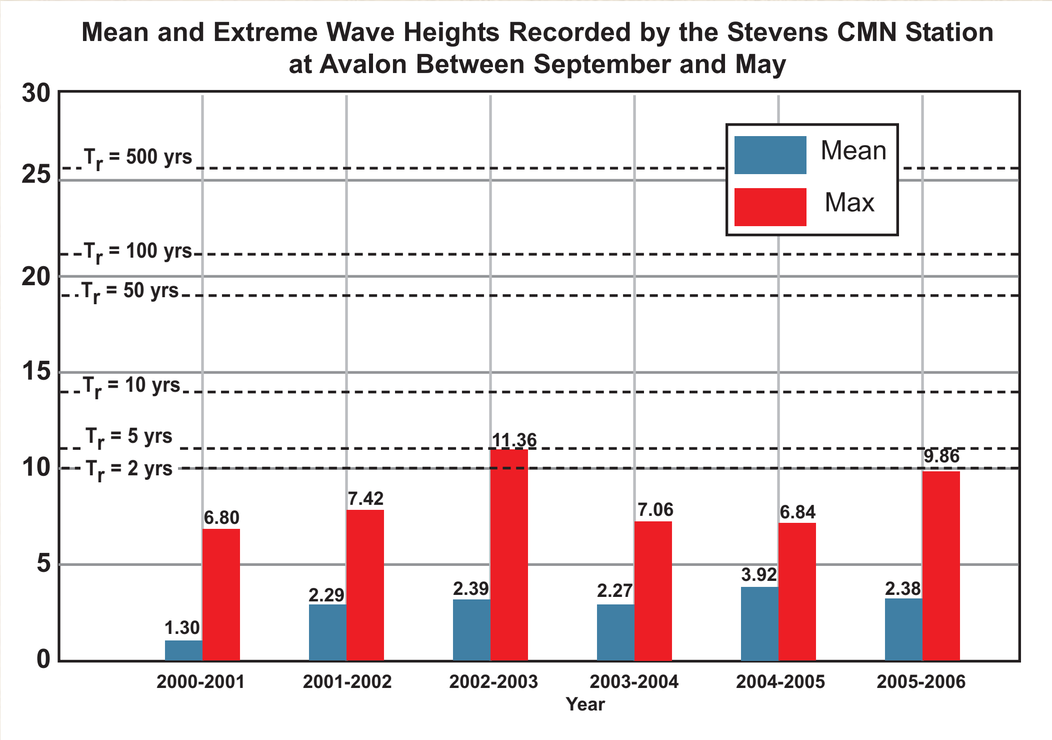
COASTAL STORM ACTIVITY

It is becoming increasingly obvious that while large waves and powerful storm surges are both capable of inducing significant beach erosion, it is when both conditions occur simultaneously that the consequences are most extreme. New Jersey was fortunate once again this past winter in that many of the large wave events were not accompanied by excessively high water levels.

Overall, relatively calm conditions prevailed for most of the winter. The Stevens Coastal Monitoring Network gauge at Avalon recorded an average significant wave height of 2.38 ft, which is on par with the observations over the last four years. Although the average wave height recorded by the Coastal Monitoring Network gauge at Long Beach Island was slightly larger (2.59 ft), this represents the lowest average wave height at the site over the past three winters. In terms of extreme events, the Avalon gauge recorded a 9.86-ft wave on February 12th, in conjunction with the blizzard that blanketed much of the state with up to 2 feet of snow. This represents a wave that has historically occurred about once every 2 years or can be said to have a return period (Tr) of approximately 2 years. During the same storm, a 13.6-ft wave was recorded by the Long Beach Island gauge. This represents the largest wave in the 4+ years of measurements at Long Beach Island, and corresponds to a wave height with a return period of approximately 8.5 years. The difference in measured wave height during this storm exemplifies





on the 18th occurred during a period of relatively low tides with a maximum recorded water level of only +5.7 ft MLLW. Interestingly, the maximum recorded water surface elevation of the winter reached +7.0-ft MLLW and occurred on January 31st during a period of relatively calm (less than 5-ft) wave activity but strong spring tides. This is significant because had the 2-ft surge occurred during a period of intense wave activity, the impact on New Jersey's beaches could have been significant. With the exception of the Blizzard of 2006, February was fairly calm as was March, April and the early part of May.

the type of variability often observed along the New Jersey coast. Fortunately, this event did not occur during a period of particularly high tides, and while the blizzard generated a 3-ft storm surge, water levels only reached an elevation of +6.5 feet above Mean Lower Low Water (MLLW) at Atlantic City. Tides along the Jersey Shore typically range from 0 to 4.6 feet above MLLW.

Although the February 12th storm was by far the winter's most significant in terms of peak wave height, there were several other storms of note. October saw the first prolonged period of increased wave activity, as storms on the 12th and 25th of the month created waves in excess of 7.5 feet. While the storm on the 25th was more intense, the earlier storm persisted for several days, as waves in excess of 5 feet were consistently measured over a three day period. Both October events were accompanied by water levels in excess of +6.5 feet MLLW, with the earlier storm generating elevated water levels for a period of five days and the latter storm generating the largest storm surge of the year, reaching 3.4 feet above the astronomically predicted tide level. In contrast, November and the early part of December were remarkably calm. Two significant storms occurred in January on the 3rd and the 18th. Larger waves were recorded at LBI during the earlier storm, while it was the latter storm that created the more significant waves at Avalon. In both cases, the maximum recorded wave heights were between 8 and 10 feet. The storm on the 3rd was accompanied by a maximum water level in excess of +6.5-ft MLLW, while the storm

An interesting phenomenon that occurred this past year and appears to be constant from year to year, is a cyclical pattern of calm and storm periods that is particularly pronounced from March through May. What these storms lack in intensity, they make up for in consistency. A statistical analysis of the past five years of data has shown that the observed pattern consists of a rapid increase in wave heights, followed by an approximately 2-week period of steadily declining/calm waves before the next significant wave event occurs. Currently it is believed that this 2-week cycle is related to the regular passage of weather systems through the region during March and May.

COASTAL ASSESSMENT

The four most significant storms of the winter season in terms of impacts to New Jersey beaches were the October 13th, October 25th, January 3rd, and February 12th storms. Although perhaps most remembered for the intense rain (up to 11" in 36 hrs) and coastal flooding which accompanied it, the October 13th storm caused extensive erosion

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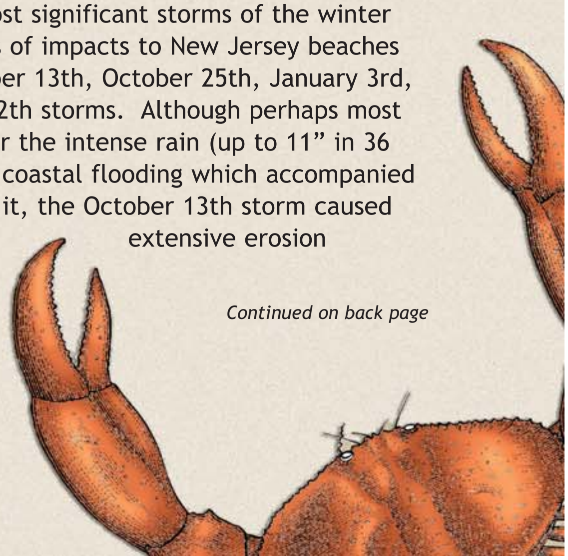

throughout the state. Only Cape May County was spared the brunt of the storm. In terms of peak intensity, the October 13th storm was not exceptional; however because the storm conditions persisted over a period of several days, its impact was significant. Following on the heels of the first storm, the hybrid coastal storm on October 25th composed of the remnants of Tropical Storm Alpha, Hurricane Wilma, and an approaching cold front, was one of the most intense storms of the season, and the most destructive in terms of its impact on New Jersey beaches. The 3-ft storm surge and strong wave action combined to cause significant damage to beaches which were already weakened as a result of the first storm. As expected, recently nourished beaches such as those in northern Monmouth County which began the season with a wide beach built up over the previous summer, withstood this initial one-two punch much better than those that began the winter in an eroded condition. Although it appeared that New Jersey's beaches were destined for a long hard winter, the relatively calm weather conditions in November and December provided a respite, and allowed most beaches to partially recover. This calm period was interrupted by the January 3rd storm which, although fairly intense, had a limited impact due to its short duration. Significant erosion was confined to areas weakened by the previous two storms where a lack of sediment prevented sufficient recovery. The final major storm of the season on February 12th produced moderate erosion; however given the intensity of the measured waves the results could have been much worse. The current bi-weekly storm/calm cycle signals the transition to milder summer conditions which will help to rebuild the beaches. Overall, it is expected that much of the sand eroded from the beach during this past winter is currently being stored offshore in sandbars. Given an extended period of calm weather, this sand should eventually work its way back on shore ensuring everyone a spot on their favorite beach as the summer progresses.

SUMMER OUTLOOK

The weak La Nina conditions currently present over the tropical Pacific are forecast to persist through October 2006, which, in combination with warmer sea surface temperatures in the tropical and northern Atlantic are expected to produce an active 2006 hurricane season. The 2006 Atlantic Hurricane Season Forecast issued by Dr. William Gray and Philip Klotzbach of Colorado State University's Tropical Meteorology Project calls for a total of 17 named storms, with 9 of these being classified as hurricanes. This is well above the average of 9.6 named storms and 5.9 hurricanes for the period from 1950-2000. Of these hurricanes, 5 are predicted to be intense, with sustained winds greater than 115 mph. While the probability of a major hurricane (category 3, 4 or 5) striking the U.S. is given as 81%, the probability of such a storm striking the New Jersey coast is less than 0.1%. While a direct impact from a major hurricane remains fairly unlikely, there is a relatively high probability that coastal New Jersey will be impacted by tropical storm force winds (40-75 mph). According to the forecast, the probability of tropical storm force winds affecting Cape May, Atlantic, and Cumberland counties is 11.1%, while Ocean, Monmouth, and Burlington Counties have slightly higher probabilities of 14.1%.

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