

## Hudson River Tides

### Transcript / Slide Notes

#### Slide 1

As you've read (and probably already know), an estuary is the place where fresh and saltwater meet. Perhaps less talked about, yet of equal import is the fact that estuaries are tidal. You read a bit about tides in The Hudson book, so now I'd like to give you the opportunity to put your new knowledge into action, while learning some basic things like how to read tide tables, as well as some nuanced, but significant features of Hudson River tides.

I would like to also point out that the Cary Institute has a Hudson River tides lesson on its Changing Hudson Project website. There is a link available on the course site under "Resources/ Resources-Lesson Plans."

#### Slide 2

When do you think we'll see the *highest* high tides? When should we expect the *lowest* high tides? Use your knowledge of how the earth, sun, and moon interact to make a prediction before you continue on to the next slides! And write your prediction down!

#### Slide 3

Okay. To answer our questions, we're going to look at data about how high the tides are expected to be each day over a period of time. These data are contained in tide tables. You'll note that I said how high they are *expected* to be; that's because tide tables are predictions of tide height, based on known phenomena (like the revolutions of the earth, sun, and moon). Local factors, like the day's weather, can also affect how high the tides actually get on any given day. But for our purposes, we just to know tidal trends through time, based on known, natural phenomena.

You can access Hudson River tide tables from many websites. Personally, I like to use the NOAA data. But before we answer our questions, let's first look at what information is presented in these tables.

--You'll see the orange arrow in the top-left points to a site along the Hudson River—The Battery in New York City. Tide tables are location-specific, so you need to choose the table for your location.

--The red arrow toward the top, points to a date range, which is also shown in more detail in the green box at the bottom. You'll also notice that the green arrow points to a Date/Time unit of "LST/LDT." – This stands for Local Standard Time, which takes into account daylight savings time, if that locale follows it.

--You'll see the y-axis in the orange box on the left shows the height of the tide, in feet.

--Finally, you'll notice that these feet are relative to this funny abbreviation "MLLW," also highlighted in the red box beside "Datum." The MLLW – or Mean Lower Low Water – is simply a way to standardize vertical measurement of something that is constantly changing heights—sea level. There are other standards, but this is the default option on NOAA's site, and for our purposes, it really doesn't matter what we use.

#### Slide 4

Now, let's look at the tide tables in conjunction with our moons.

We see that yes, around our full moon on Sep. 19<sup>th</sup>, both high tides reached nearly 6 ft in height compared with those of the 3<sup>rd</sup> quarter moon, where even the highest high tides reached less than 4.5 feet in height, and the lower high tides only around 4 ft.

Notice that the low tides associated with the full moon are also more extreme (Nearly 0.5 ft *less than* the MLLW), while the lowest low tides at the 3<sup>rd</sup> quarter are weaker (*more* than 1 ft above MLLW).

#### Slide 5

What about the new moon?

How high do you think the high and low tides will get?

Will the high high tide and low high tide be about the same height or different heights?

Make a prediction & write it down!

#### Slide 6

Hm, well, the high tides are definitely higher than they were in the 3<sup>rd</sup> quarter moon estimates, but they're not as high as they were in the full moon estimates. Similarly, the low tides are not as low as they were in the full moon estimates, but they're certainly lower than they were in the 3<sup>rd</sup> quarter moon estimates.

Alright, looking at all these different graphs is getting confusing. Let's look at a table of tide estimates to more easily compare these different numerical values.

#### Slide 7

Alright. So now you're looking at a 2013 Battery Park Tide Table for the relevant months. (And yes, there are more days in September and October, but I cut some off to make the figures bigger and the numbers easier to read.)

Notice that these tables nicely highlight the tidally important phases of the moon for us. Also, note that the middle column displays feet, the same unit our graphs are in.

#### Slide 8

So back to our question: When do we see the *highest* high tides and when do we see the *lowest* high tides?

#### Slide 9

Hopefully, you noticed that the most extreme tides (i.e. the highest highs and lowest lows) were at the full moon, with about a six foot difference between the two tides. There are slightly less extreme tides at the new moon.

However, the 1<sup>st</sup> and 3<sup>rd</sup> quarter phase moons have particularly **weak** tides, so these are the times when you'll see particularly *low* high tides and *high* low tides—or only about a four-foot different between the two tides..

To get these data for yourself and your own classroom, I've included a link on the slide to NOAA's tide predictions site.