Final Markdown

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With waste water treatment facilities potentially reducing the input of access nutrients into the bay, nitrogen levels, and in response the macroalgae blooms, should decrease.

```
## -- Attaching packages ---------------------------------------------------------
-------------------- tidyverse 1.2.1 --
```

```
## v ggplot2 2.2.1     v purrr   0.2.4
## v tibble  1.4.2     v dplyr   0.7.4
## v tidyr   0.8.0     v stringr 1.3.0
## v readr   1.1.1     v forcats 0.3.0
```

```
## -- Conflicts ------------------------------------------------------------------
-------------- tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

```
##
## Attaching package: 'gridExtra'
```

```
## The following object is masked from 'package:dplyr':
##
##     combine
```

```
## Parsed with column specification:
## cols(
##   .default = col_double(),
##   Year = col_integer(),
##   Month = col_character(),
##   X43 = col_character(),
##   Month_1 = col_character()
## )
```

```
## See spec(...) for full column specifications.
```

```
## Parsed with column specification:
## cols(
##   .default = col_double(),
##   Year = col_integer(),
##   Month = col_character(),
##   `Chepi % Scytosiphon` = col_integer(),
##   Month_1 = col_character()
## )
```

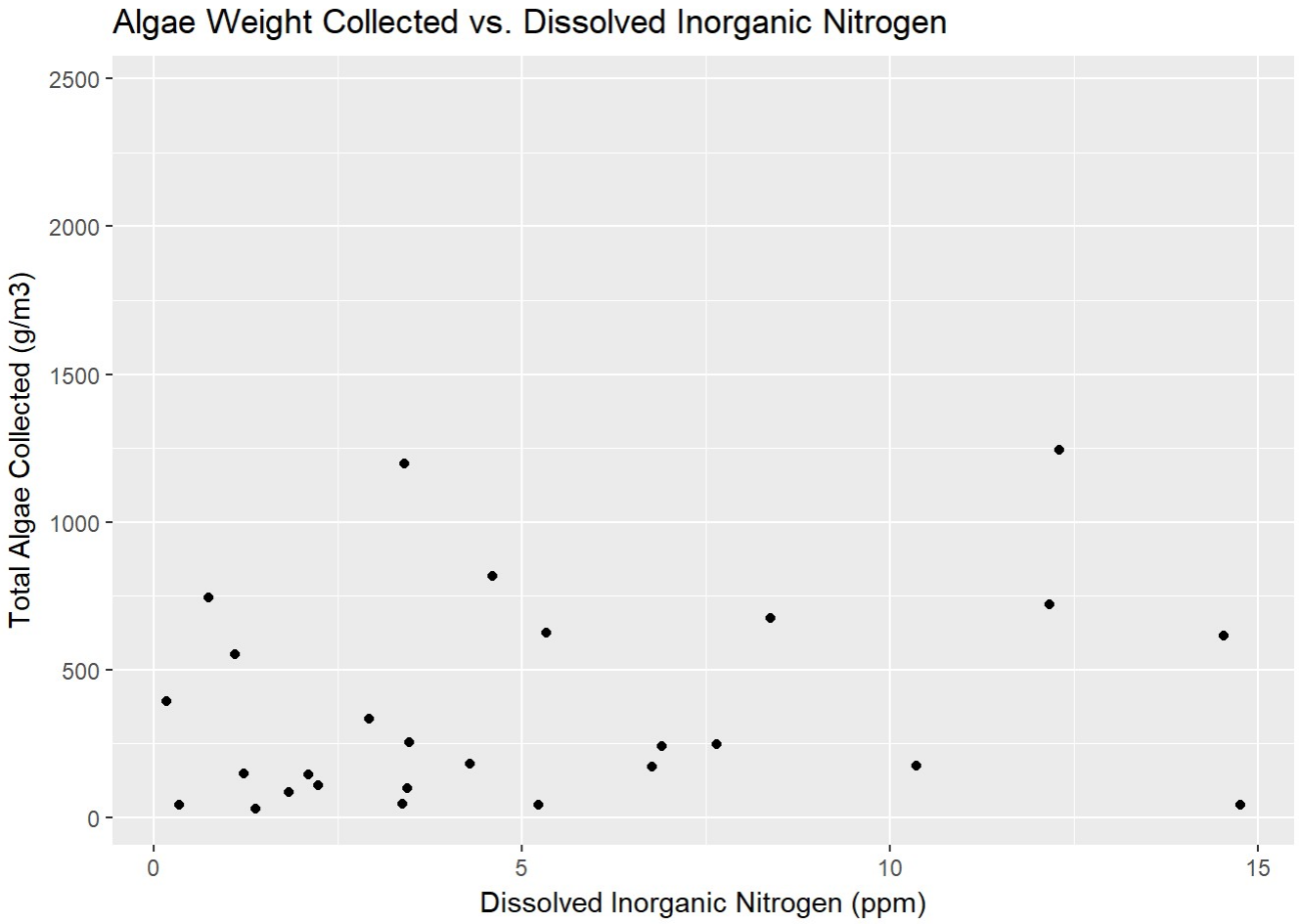
```
## See spec(...) for full column specifications.
```

```
## Parsed with column specification:
## cols(
##   .default = col_double(),
##   Date = col_character(),
##   Month = col_character(),
##   Year = col_integer(),
##   Season = col_character(),
##   Site = col_character(),
##   `Bag #` = col_integer(),
##   Depth = col_integer(),
##   `U. lactuca` = col_integer(),
##   `U. compressa` = col_integer(),
##   `U. rigida` = col_integer(),
##   `Desmarestia viridis` = col_integer(),
##   `Sargassum (g wet mass)` = col_integer(),
##   polyides = col_integer(),
##   Bryopsis = col_integer(),
##   Monostroma = col_integer(),
##   `Sphacelaria arctica` = col_integer(),
##   Cystoclonium = col_integer(),
##   Laminaria = col_integer(),
##   Diatoms = col_integer(),
##   Ahnfeltia = col_integer()
##   # ... with 23 more columns
## )
```

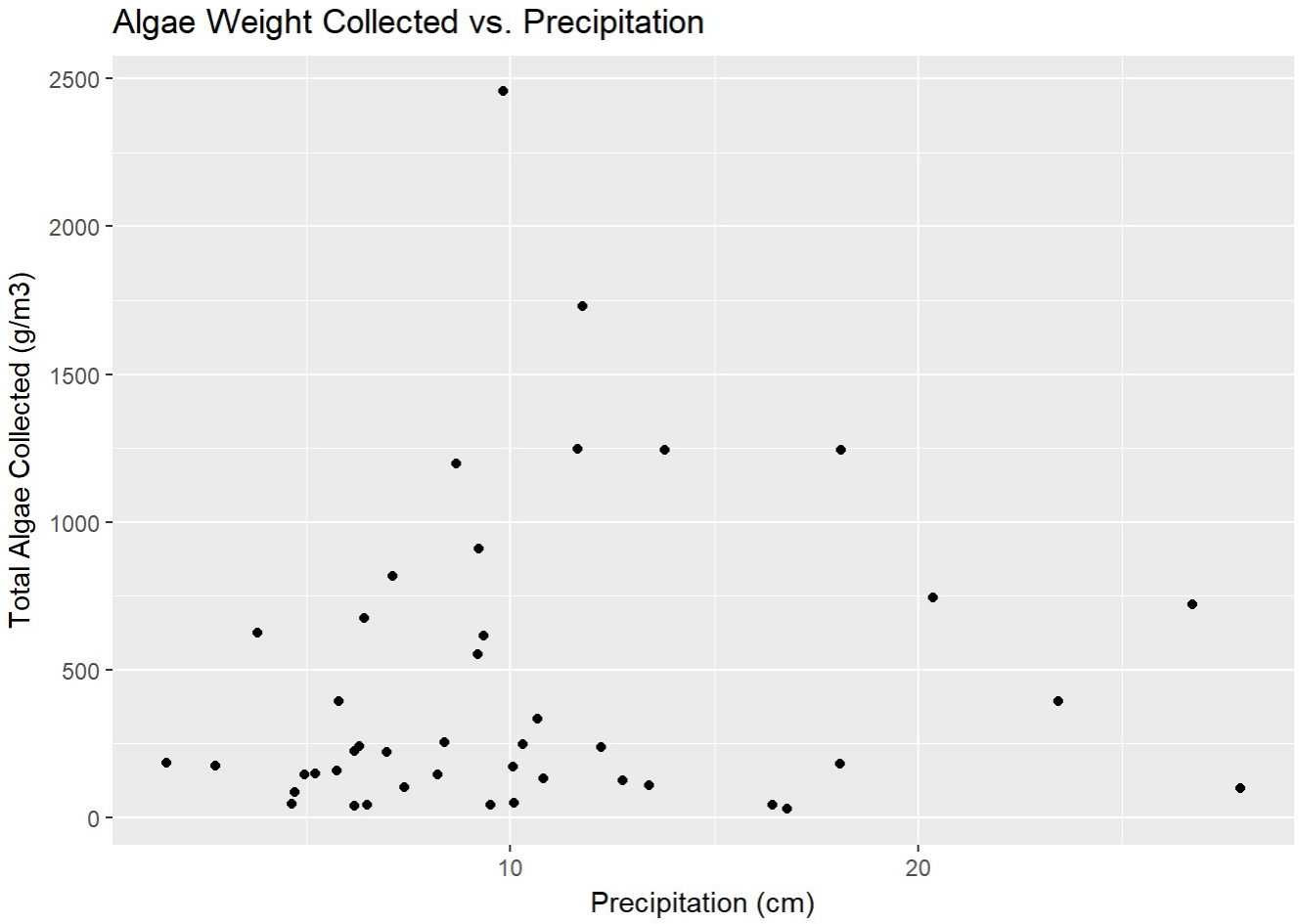
```
## See spec(...) for full column specifications.
```

```
## Parsed with column specification:
## cols(
##   .default = col_double(),
##   Date = col_character(),
##   Month = col_character(),
##   Year = col_integer(),
##   Season = col_character(),
##   Site = col_character(),
##   `Bag #` = col_integer(),
##   Depth = col_integer(),
##   `U. lactuca` = col_integer(),
##   `U. compressa` = col_integer(),
##   `U. rigida` = col_integer(),
##   `Desmarestia viridis` = col_integer(),
##   `Gymno grif (g wet mass)` = col_integer(),
##   `Ecto siliculosus` = col_integer(),
##   polyides = col_integer(),
##   Bryopsis = col_integer(),
##   Monostroma = col_integer(),
##   `Sphacelaria arctica` = col_integer(),
##   Cystoclonium = col_integer(),
##   Laminaria = col_integer(),
##   Diatoms = col_integer()
##   # ... with 26 more columns
## )
```

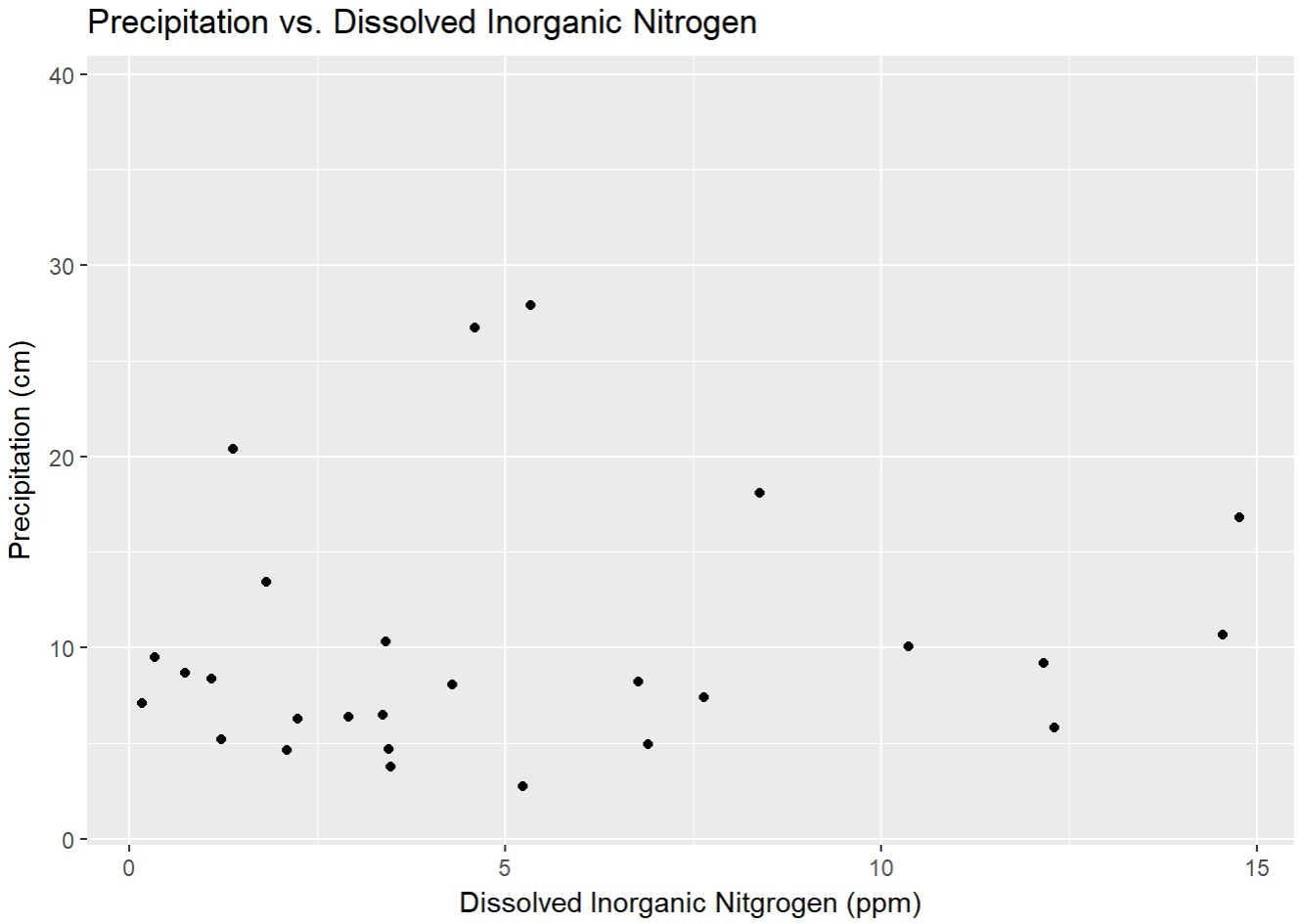
```
## See spec(...) for full column specifications.
```




```
##
## Call:
## lm(formula = GBTotalAlgae ~ NH3NO2NO3, data = monthly)
##
## Residuals:
##    Min     1Q Median     3Q    Max
## -528.7 -226.8 -159.7  219.9  866.6
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   259.30     104.80   2.474   0.0205 *
## NH3NO2NO3      21.17      15.54   1.363   0.1852
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 344.3 on 25 degrees of freedom
##   (18 observations deleted due to missingness)
## Multiple R-squared:  0.06913,    Adjusted R-squared:  0.03189
## F-statistic: 1.856 on 1 and 25 DF,  p-value: 0.1852
```

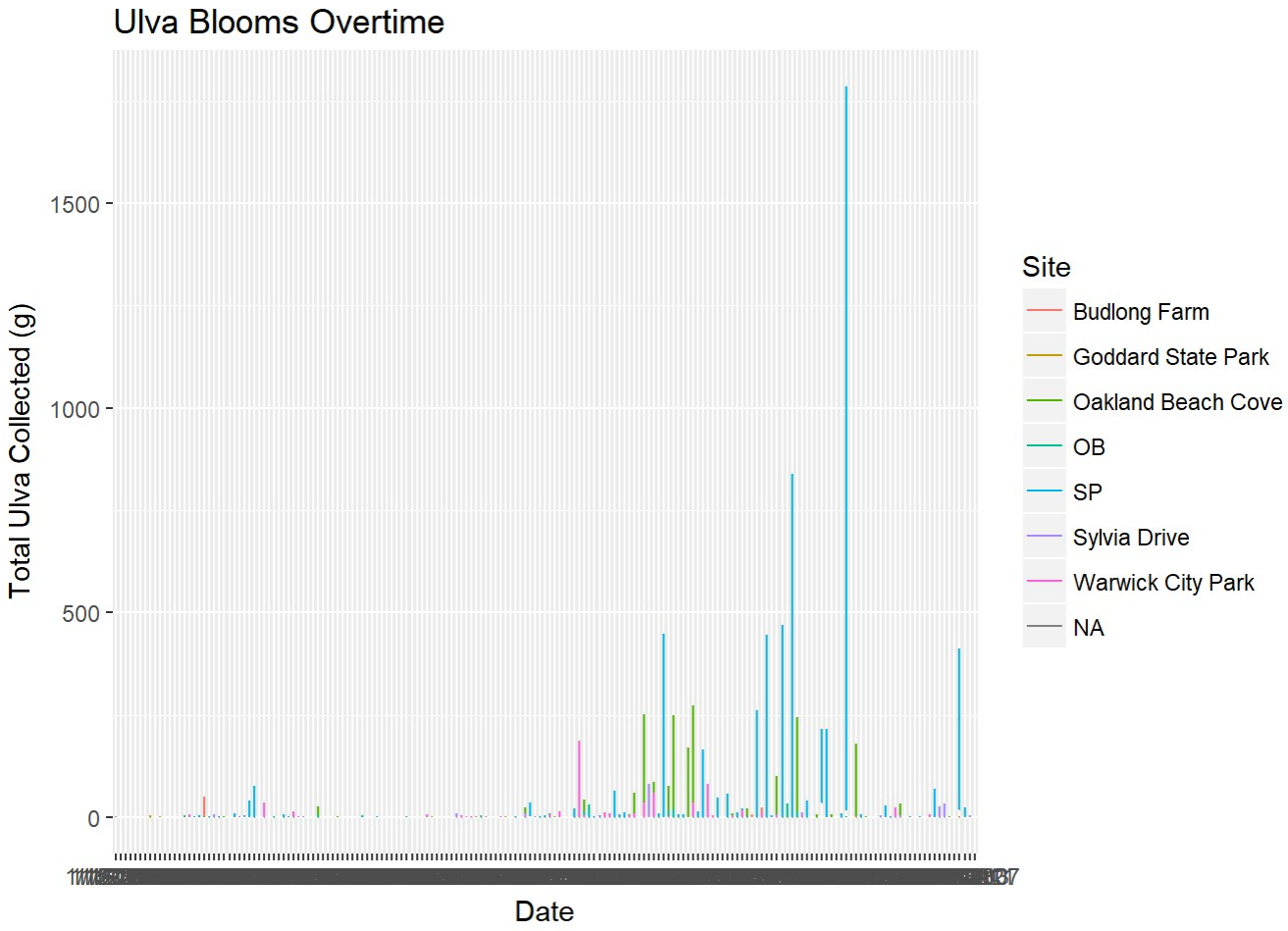



```
##
## Call:
## lm(formula = GBTotalAlgae ~ Precipitation, data = monthly)
##
## Residuals:
##    Min     1Q Median     3Q    Max
## -552.8 -320.9 -189.3  182.2 2018.6
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)     322.59     158.62   2.034   0.0483 *
## Precipitation    11.75      13.20   0.890   0.3784
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 519.7 on 42 degrees of freedom
##   (1 observation deleted due to missingness)
## Multiple R-squared:  0.01852,    Adjusted R-squared:  -0.004845
## F-statistic: 0.7926 on 1 and 42 DF,  p-value: 0.3784
```



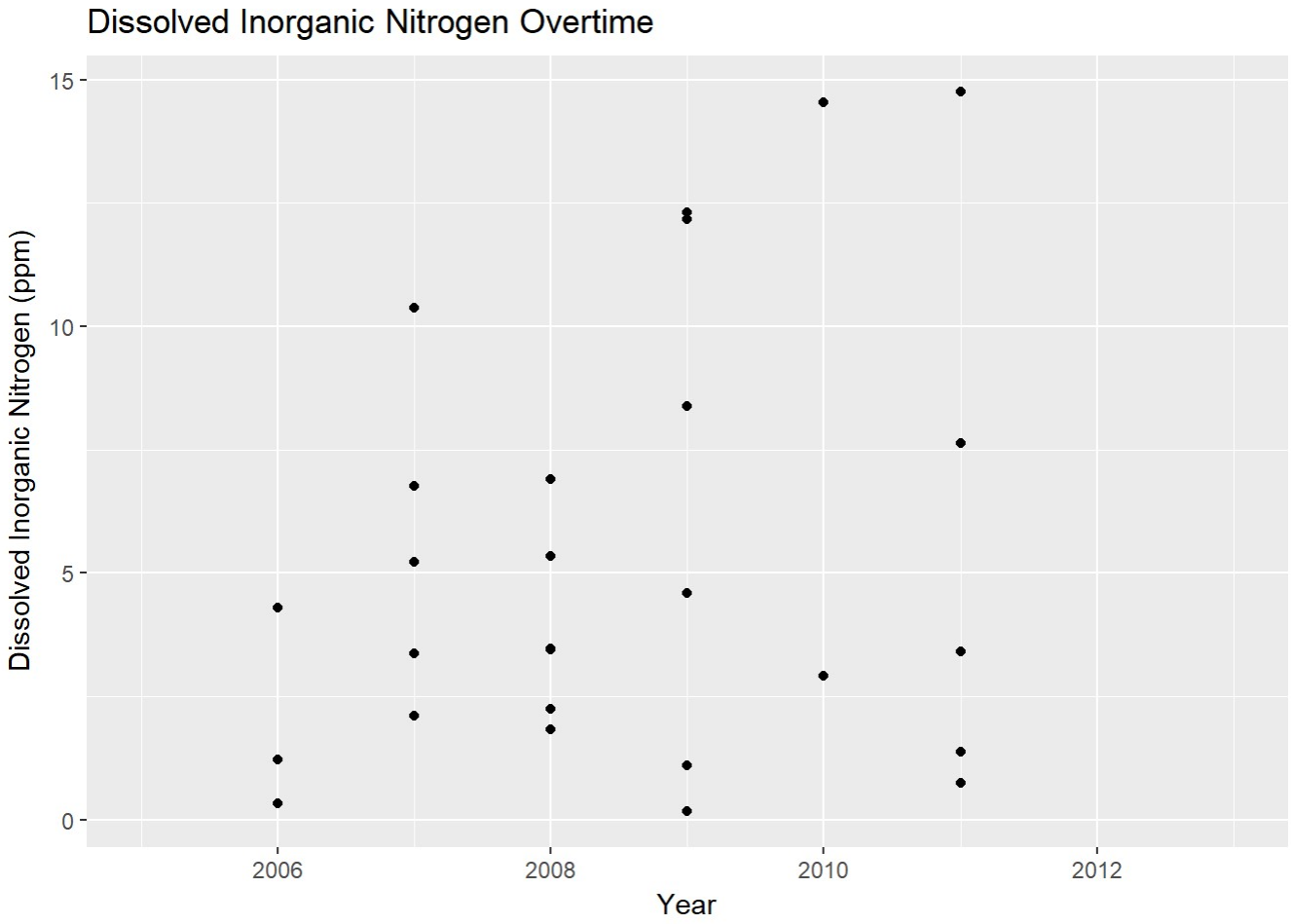

```
##
## Call:
## lm(formula = DIN ~ Precipitation, data = monthlydin)
##
## Residuals:
##    Min     1Q Median     3Q    Max
## -4.835 -3.119 -1.442  2.288  9.265
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)    4.34677    1.57216   2.765   0.0105 *
## Precipitation  0.08724    0.13163   0.663   0.5136
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.392 on 25 degrees of freedom
##   (24 observations deleted due to missingness)
## Multiple R-squared:  0.01727,    Adjusted R-squared:  -0.02204
## F-statistic: 0.4392 on 1 and 25 DF,  p-value: 0.5136
```

The first two graphs do not support the hypothesis that the ammount of macroalgae would increase with levels of dissolved nitrogen, as well as with high precipitation. However the third graph can be viewed as positive, showing that with this paticular data there is no correlation between high precipitation and high nitrogen levels, meaning precipitation is likely only a minor factor in the level of dissolved nitrogen collected.


Ulva Blooms Overtime
Total Ulva Collected (g)
1500
1000
500
0
Date
Site
Budlong Farm
Goddard State Park
Oakland Beach Cove
OB
SP
Sylvia Drive
Warwick City Park
NA

```
## List of 2
##  $ text       :List of 11
##   ..$ family       : NULL
##   ..$ face         : NULL
##   ..$ colour       : NULL
##   ..$ size         : num 4
##   ..$ hjust        : NULL
##   ..$ vjust        : NULL
##   ..$ angle        : NULL
##   ..$ lineheight   : NULL
##   ..$ margin       : NULL
##   ..$ debug        : NULL
##   ..$ inherit.blank: logi FALSE
##   ..- attr(*, "class")= chr [1:2] "element_text" "element"
##  $ axis.text.x:List of 11
##   ..$ family       : NULL
##   ..$ face         : NULL
##   ..$ colour       : NULL
##   ..$ size         : NULL
##   ..$ hjust        : NULL
##   ..$ vjust        : NULL
##   ..$ angle        : num 90
##   ..$ lineheight   : NULL
##   ..$ margin       : NULL
##   ..$ debug        : NULL
##   ..$ inherit.blank: logi FALSE
##   ..- attr(*, "class")= chr [1:2] "element_text" "element"
##  - attr(*, "class")= chr [1:2] "theme" "gg"
##  - attr(*, "complete")= logi FALSE
##  - attr(*, "validate")= logi TRUE
```

```
## Warning: Removed 24 rows containing missing values (geom_point).
```



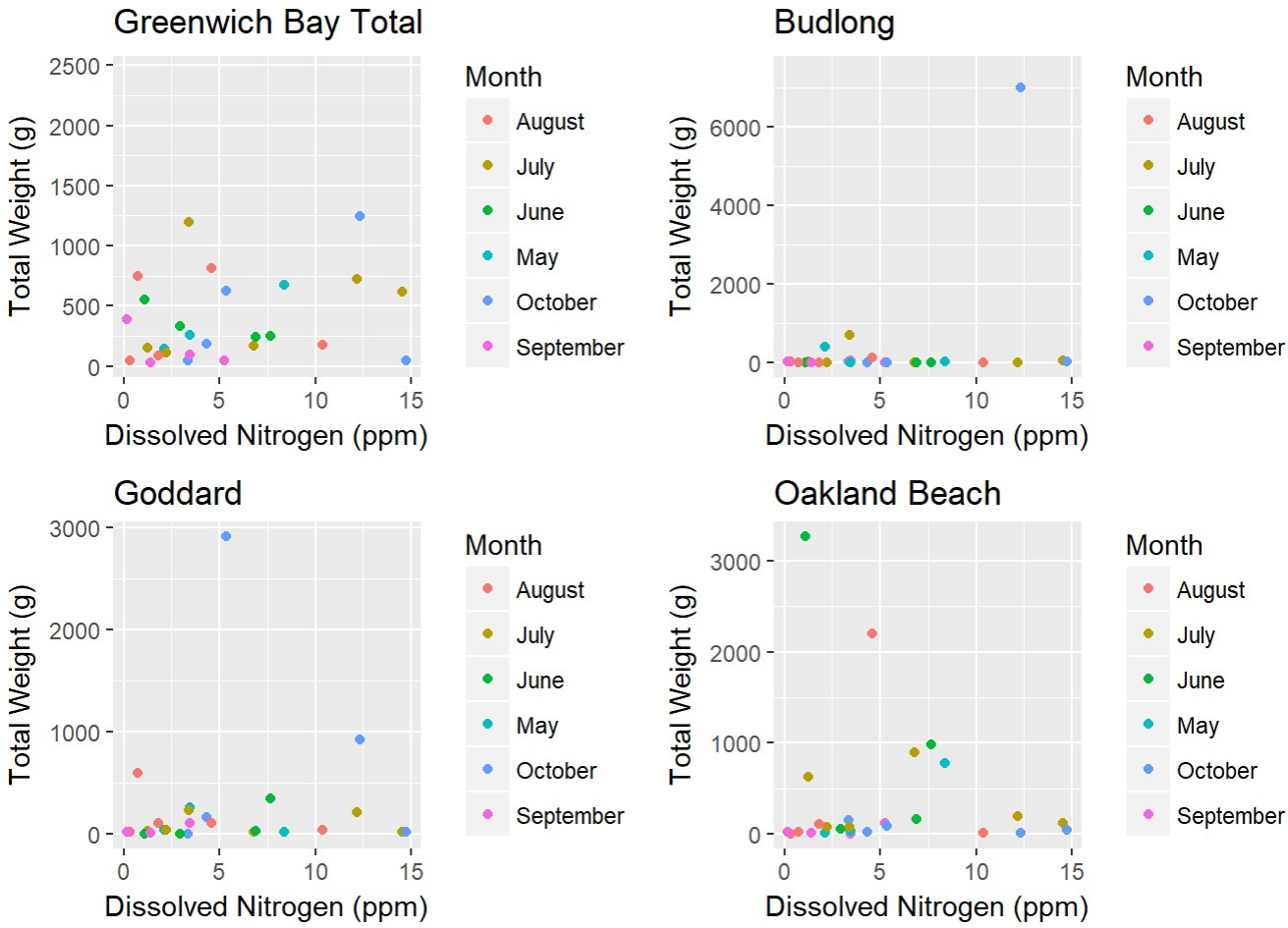
As an exploratory analysis, and with Ulva being one of the major macroalgae involved in blooms, I made a graph showing how the amount of Ulva collected at the different stations changed over time. The graph shows another unexpected result, with blooms of Ulva happening much more often in later years. The second graph shows that clearly the ammount of inorganic carbon collected in our samples did not decrease overtime, so yet another theory of what we might find was unsupported in our data.

```
## Warning: Removed 18 rows containing missing values (geom_point).
```

```
## Warning: Removed 19 rows containing missing values (geom_point).

## Warning: Removed 19 rows containing missing values (geom_point).
```

```
## Warning: Removed 18 rows containing missing values (geom_point).
```



This last compilation of plots was really just to create a visual to start to look at the sites individually, and compare them to eachother. Oakland Beach had the most blooms out of the three individual sites depicted here, so it would be interesting to see what of the rest of them look like in future analysis.