Assignment #2: Logistics Growth Report

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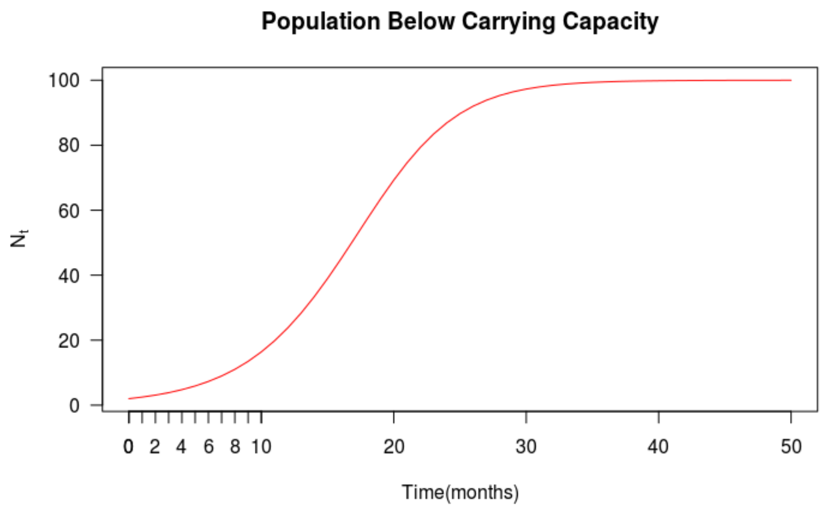
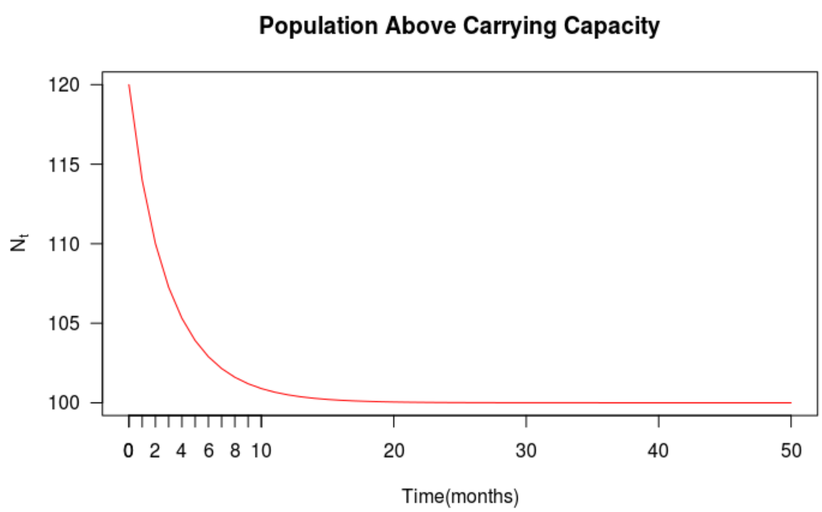
1 A Brief Introduction

A logistic growth model observed was represented by the equation $N_{t+1} = N_t + rN_t\left(1 - N_t/K\right)$; where N_t represents population , r represents growth rate and t represents time, and K represents the carrying capacity. The purpose of this lab was to see the effects on population over time impose by the carrying capacity. Here, I will generate two sets of graphs where the carrying capacity(K) is set to 100. One set will be initialized with the population below the carrying capacity and the other set will be initialized with the population above the carrying capacity.

2 Results

2.0.1 Graph





3 Conclusion

Unlike the exponential growth, the graph of a logistic growth is affected by the carrying capacity. On the first figure, when the population is below the carrying capacity, the growth rate r decreases as the population approaches K, and eventually settles around K creating a S-curve. On the second graph, when the population is already above the carrying capacity, the graph showed a downward trend towards K.

4 Appendix

4.0.1 C Code for Exponential Growth Model

```c
// Name: Timmy Nguyen
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// Assignment 2: Logistics Growth Model
// Biol 480 Spring 2016

#include <stdio.h>
#include <string.h>

int main()
{
  // Initial variable length(in months)
  int length;

  // Given reproductive rate
  double r = 0.25;

  // Initial Carrying Capacity
  int K_ = 100;



  /**
   * Prompt user for specific time period in months
   */
  printf("Enter time(in months): \n");
  scanf("%i", &length);

  // Create First Array
  double pop_below_K[length];

  // Sets the population below carrying capacity
  pop_below_K[0] = 2;

  /**
   * @brief Logistic Population Growth Equation
   * @details Output prediction observation values
   * @return prediction data
   */
  for (int i = 0; i < length; ++i)
  {
    pop_below_K[i + 1] = pop_below_K[i] + r * pop_below_K[i] *
        (1 - (pop_below_K[i] / K_));
```

```
    printf("%.4f\n", pop_below_K[i]);
  }


  // Creating Second Array
  double pop_above_K[length];
  // Sets the population above carrying capacity
  pop_above_K[0] = 120;

  /**
   * @brief Logistic Population Growth Equation
   * @details Output prediction observation values
   * @return prediction data
   */
  for (int j = 0; j < length; ++j)
  {
    pop_above_K[j + 1] = pop_above_K[j] + r * pop_above_K[j] * (1 - (pop_above_K[j] / K_));
    printf("%.4f\n", pop_above_K[j] );
  }

  /**
   * FILE SAVE
   */

  char text[100];
  char filename[100];
  FILE *outfile;

  printf( "Save data to disk file ? (y/n) : " );
  scanf( "%s", text );
  if ( strcmp( text, "y" ) == 0 )
  {
    printf( "Enter filename for first dataset : " );
    scanf( "%s", filename );
    outfile = fopen( filename, "w" );
    for ( int i = 0; i <= length; i++ )
    {
      fprintf( outfile, "%4.1i\t%7.4f\n", i, pop_below_K[i]);
    }
    fclose( outfile );

    printf( "Enter filename for second dataset: " );
    scanf( "%s", filename );
    outfile = fopen( filename, "w" );
```

```
    for ( int i = 0; i <= length; i++ )
    {
      fprintf( outfile, "%4.1i\t%7.4f\n", i, pop_above_K[i] );
    }
    fclose( outfile );
  }



  return 0;


}
```

4.0.2 R Code for Generating Graph

```
mydata = read.table(file.choose())

colnames(mydata)<-c("Time(months)", "Model")

plot(mydata[,1:2], type="l",main="Population Above Carrying Capacity"
      ,xlab="Time(months)",ylab =expression("N"[t]), las=1, col="Red")
axis(side=1, at=c(0:10))
```