R Shiny Applications

10/20/2022 – MSGIC Quarterly Meeting

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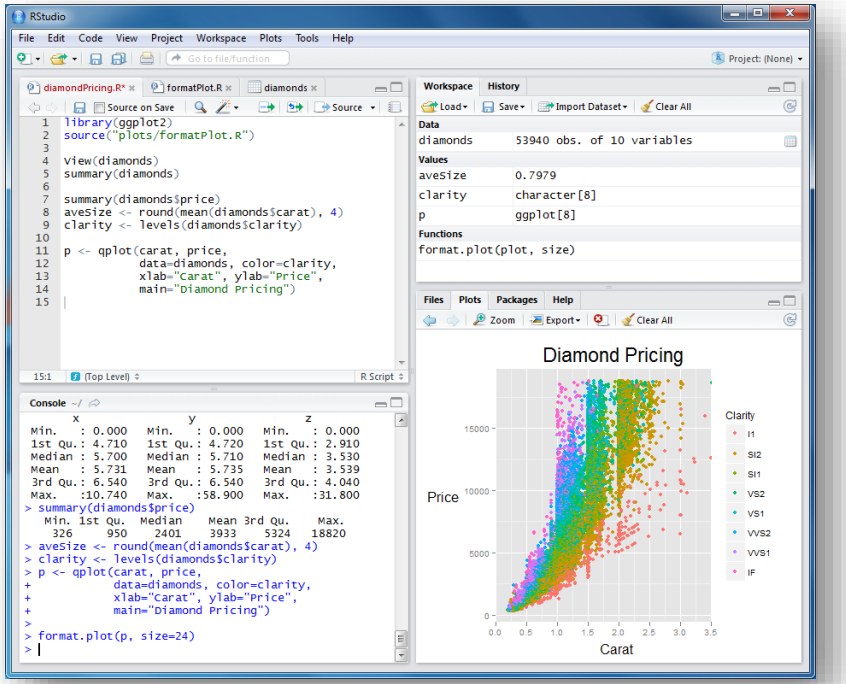
What is R?

- Statistical Programming Language
- Free and Open Source
- Over 10,000 packages for both general-purpose statistical libraries and niche analytical methods.
- R can be used via it's native GUI or a third party software such as R Studio.



What is R Studio?

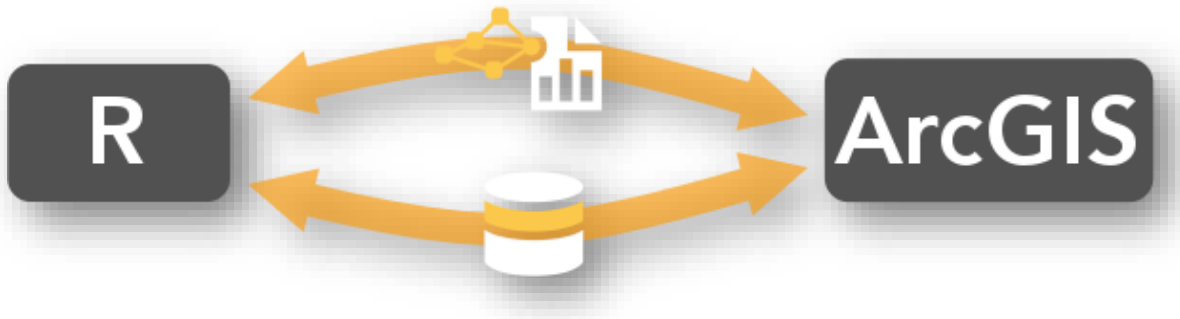
- R Studio is an Integrated Development Environment (IDE).
- An IDE is software where you can write lines of code, execute them in R*, and see the results.
- R Studio also develops its own libraries for specific functions for data science purposes.
- Both R and R Studio are free.

Geospatial data

- R has many packages available to manipulate and create geospatial data
- Plotting and mapping with mapview, leaflet, ggplot2
- ESRI integration

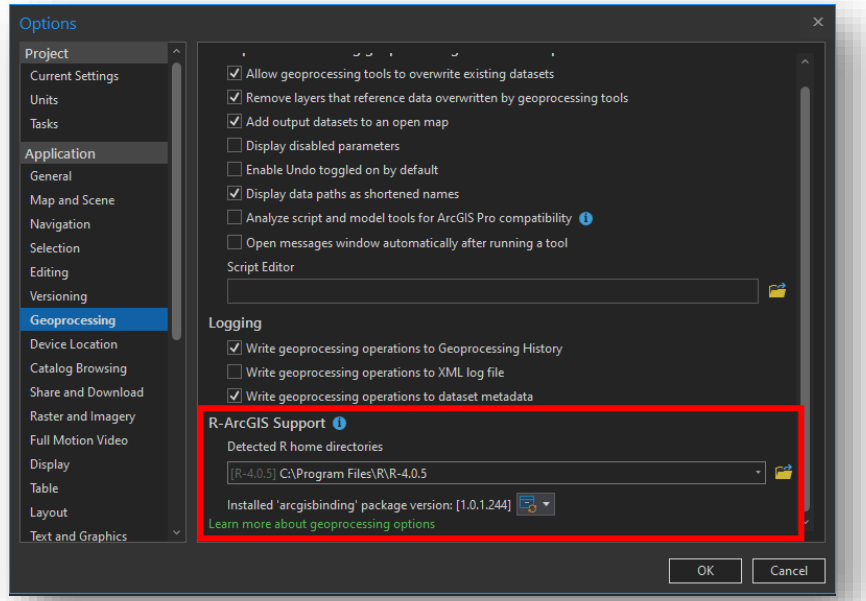
Leaflet

R – ArcGIS Bridge

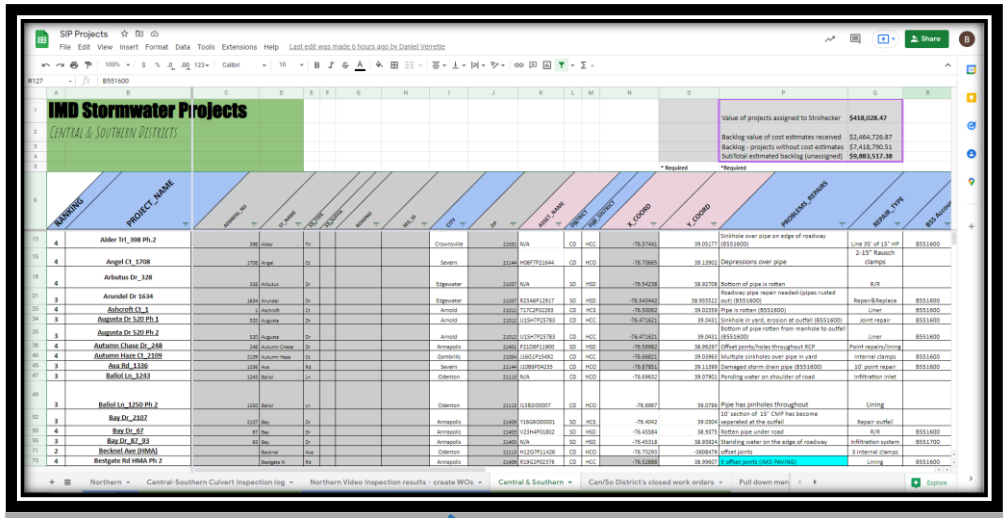


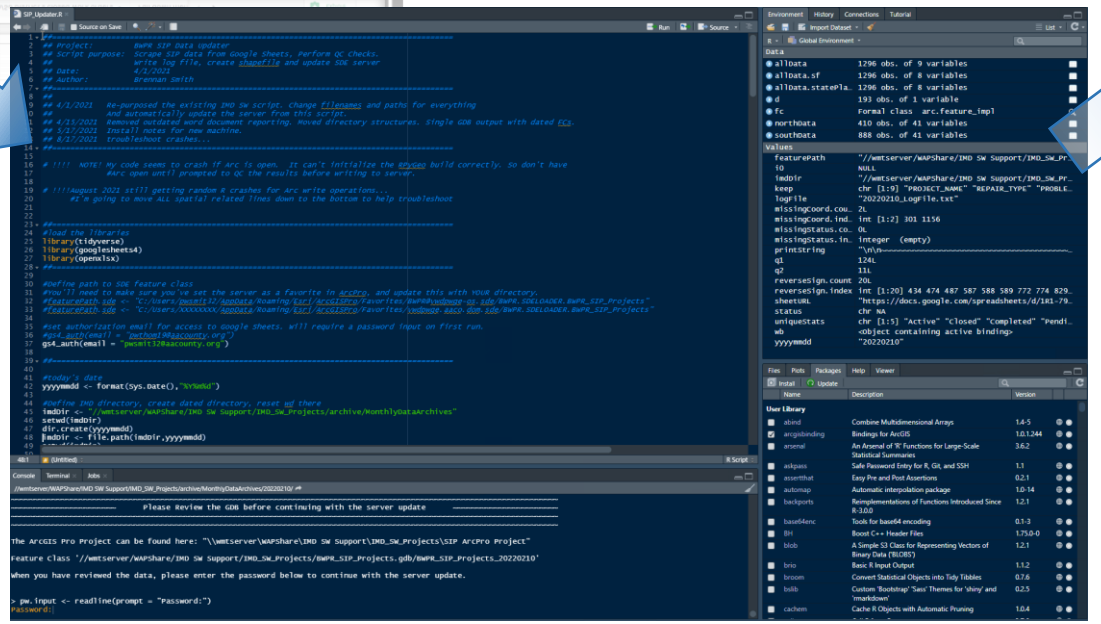
- Connects the two software packages
- Seamlessly convert and transfer data between R and ArcGIS
- R package ‘arcgisbinding’

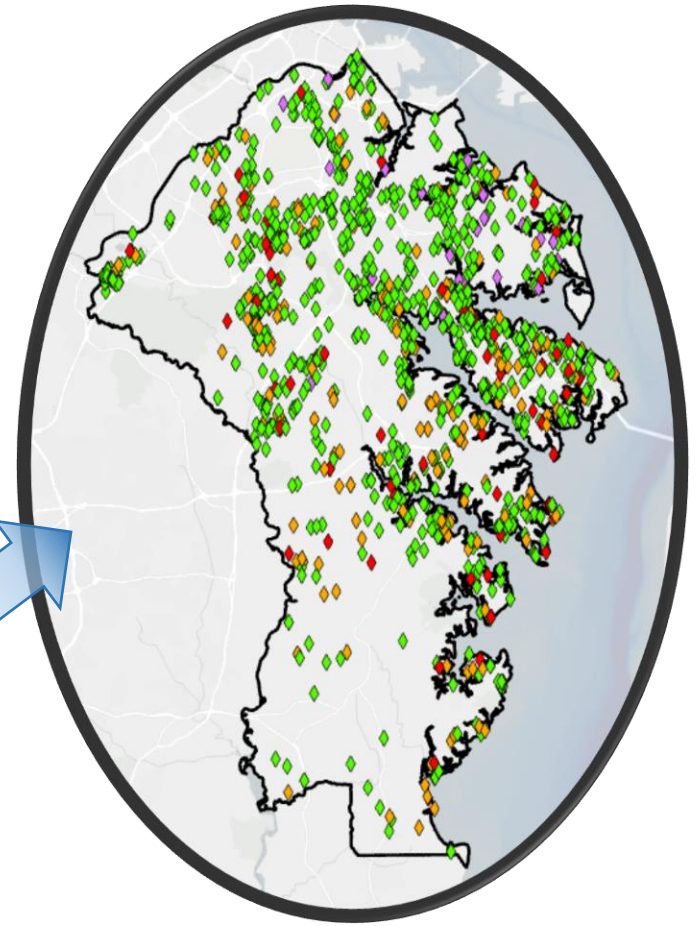
```
1  library(arcgisbinding)
2  arc.check_product()
```



R – Streamline Workflows







Shiny is a library, developed by R Studio

shinyapps.io

- Shiny allows you to build interactive web/desktop/mobile apps using R.
- Shiny works using two scripts, one controlling the interface, and one controlling the back end processes. The two scripts react to each other.

ui.R

```
library(shiny)

# Define UI for application that draws a
histogram
ui=fluidPage(

  # Application title
  titlePanel("New BWPR App"),

  # Sidebar with a slider input for year
selection
  sidebarLayout(
    sidebarPanel(
      sliderInput("Year",
                  "Select Year(s):",
                  min = 2014,
                  max = 2021,
                  value = 2021)
    ),

    # Show a plot of the generated
distribution
    mainPanel(
      plotOutput("ImperviousRestored")
    )
  )
)
```

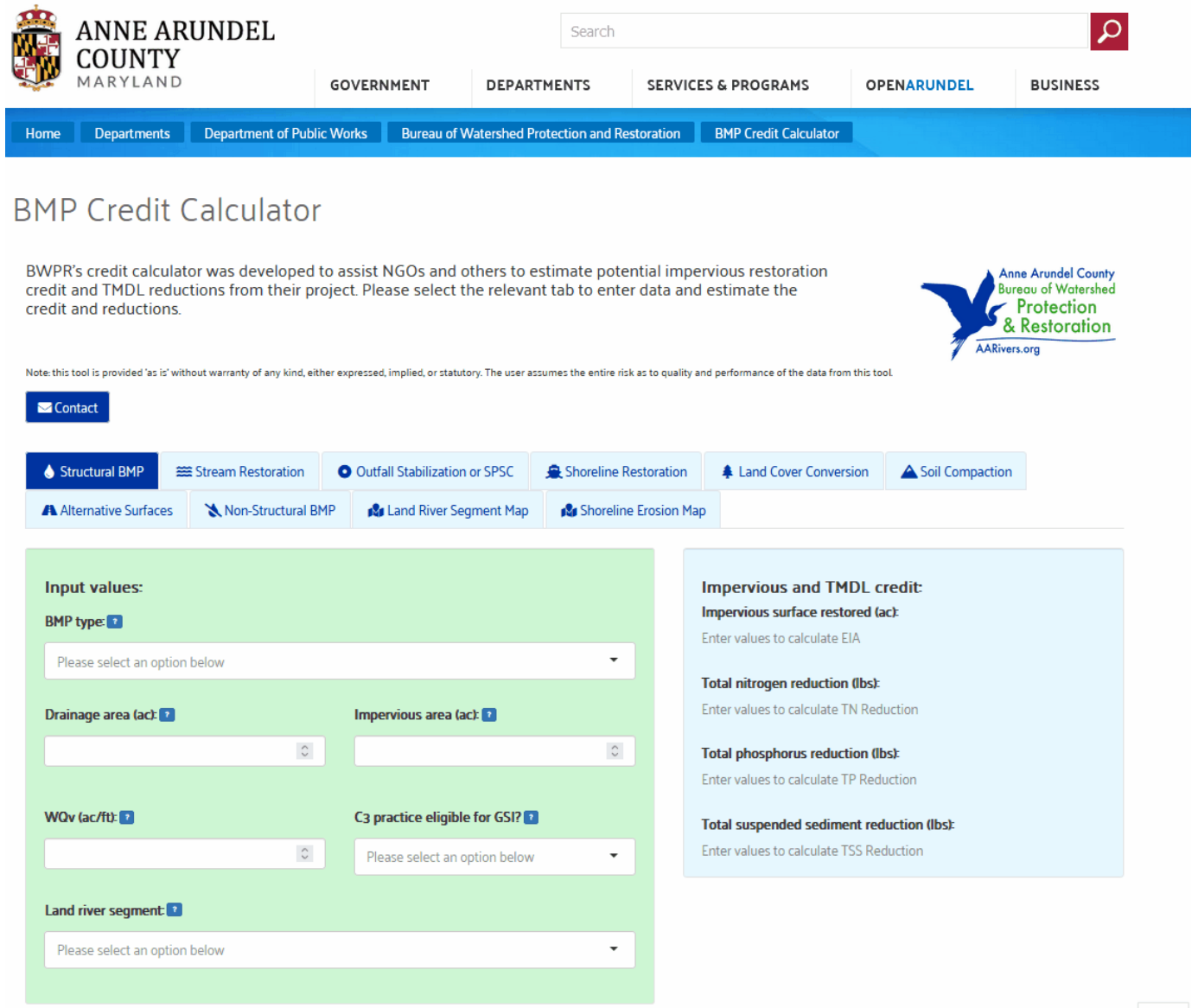
server.R

```
library(shiny)

load("BWPRRestoration.RData")

# Define server logic required to draw
a plot
server <- function(input, output,
session){
    output$distPlot <- renderPlot({

        # select data based on
input$Year from ui.R
        df    <- BWPRRestoration
        df.select <- BWPRRestoration
%>% select(year = input$Year)

        # plot selected data
        plot(df.select$year,
df.select$restoration, col =
'darkgray')

    })

}
```

What kind of applications?

Web Form – Credit Calculator

- Standardized interpretation of regulations
- Updates can be pushed centrally, meaning the latest version will always be online.
- Popup boxes give help and prompt the user, meaning that the tool is self-explanatory.



https://www.aacounty.org/departments/public-works/wprp/bmp-credit-calculator

Web Form – Geospatial Component

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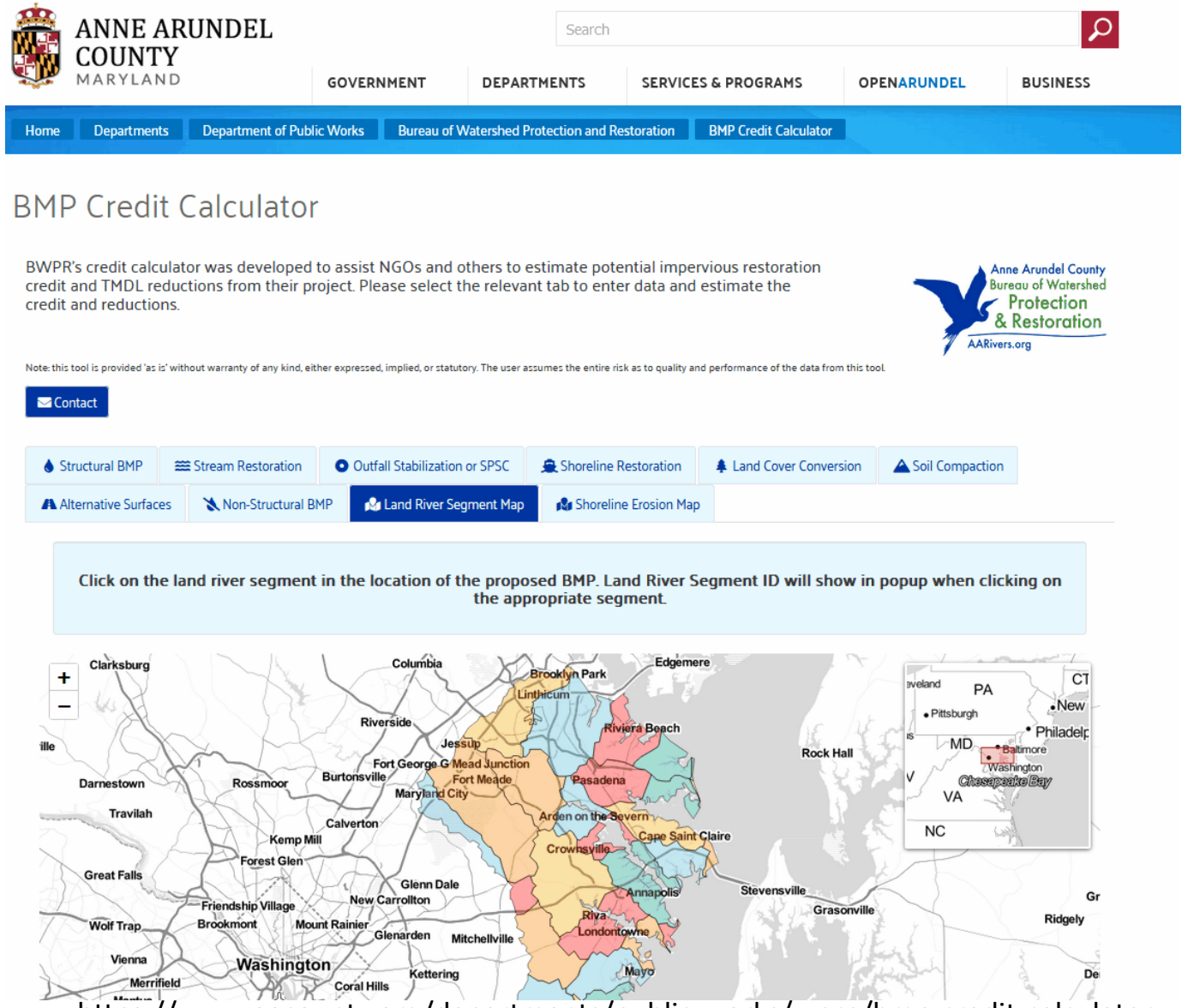

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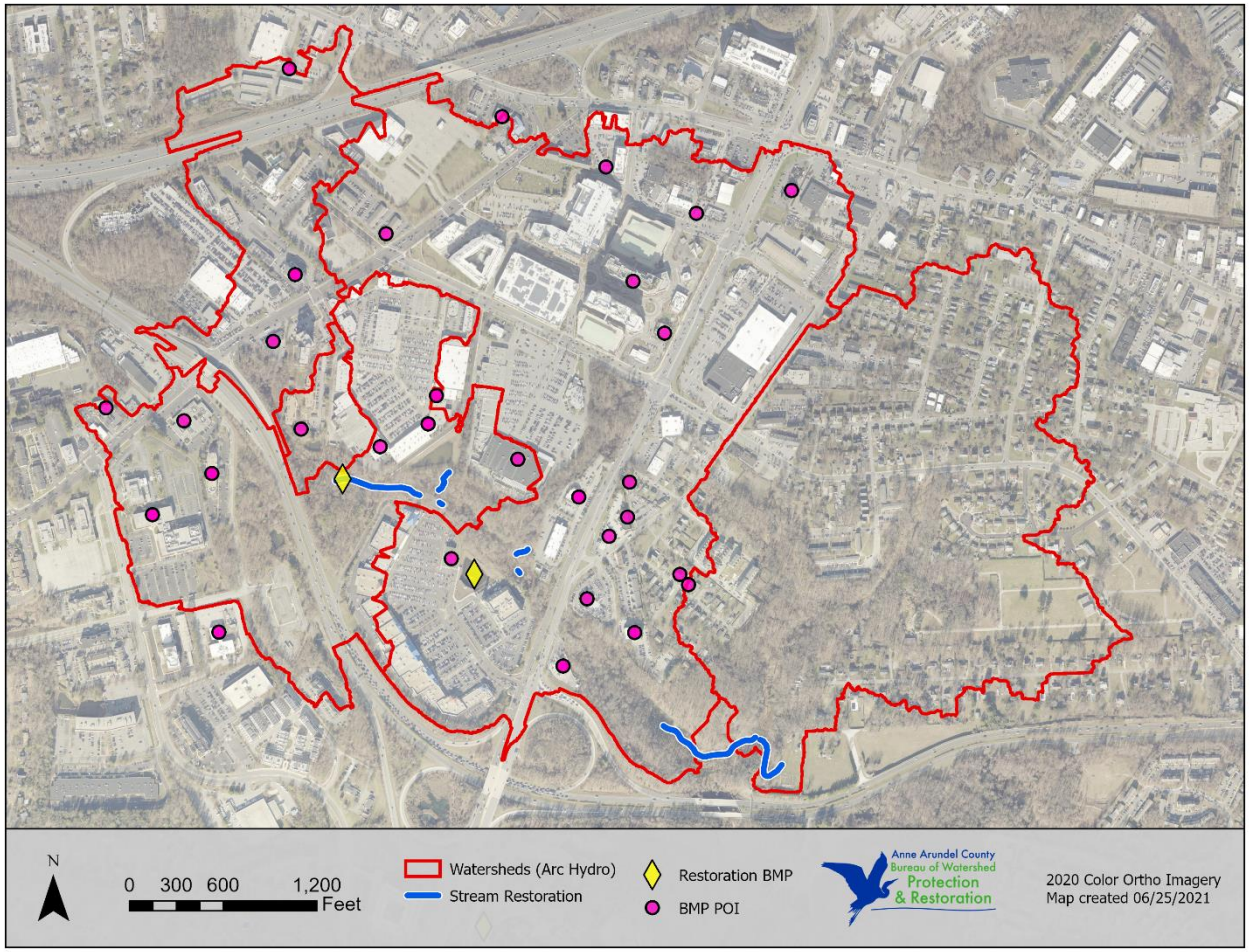
Summarizing existing data

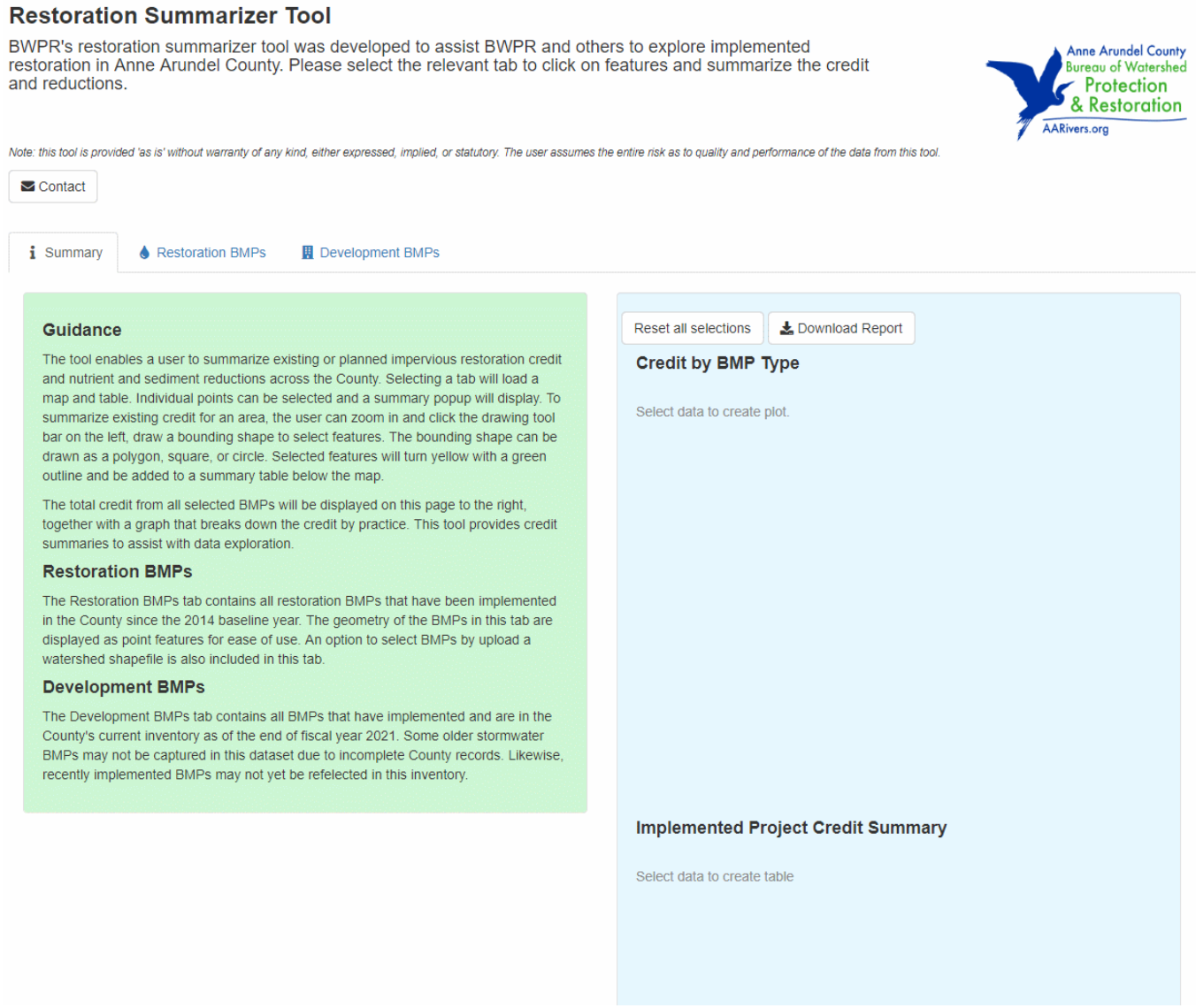
- Existing impervious treatment in a new BMP's drainage area needs to be accounted for when determining eligible credit.

- Determining the extent of existing treatment in an area of interest or a watershed can be laborious process.



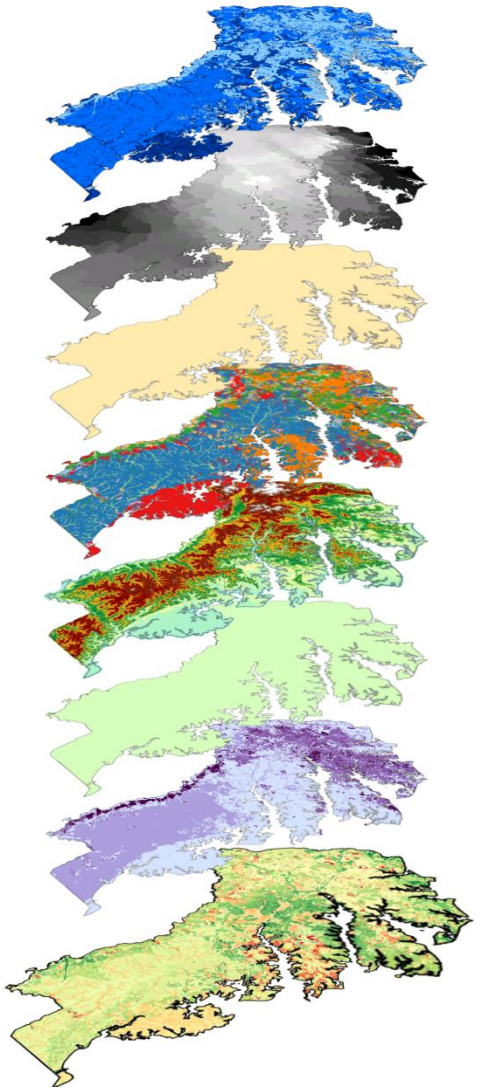
Summarizing existing data

- Maps are interactive and data can be selected by drawing bounding boxes on the map.
- Shapefiles can be uploaded to summarize existing treatment within a drainage area.
- Selections are added to a summary table below the map, and added to a plot and table on the summary page.
- Reports are generated with Rmarkdown and LaTex.



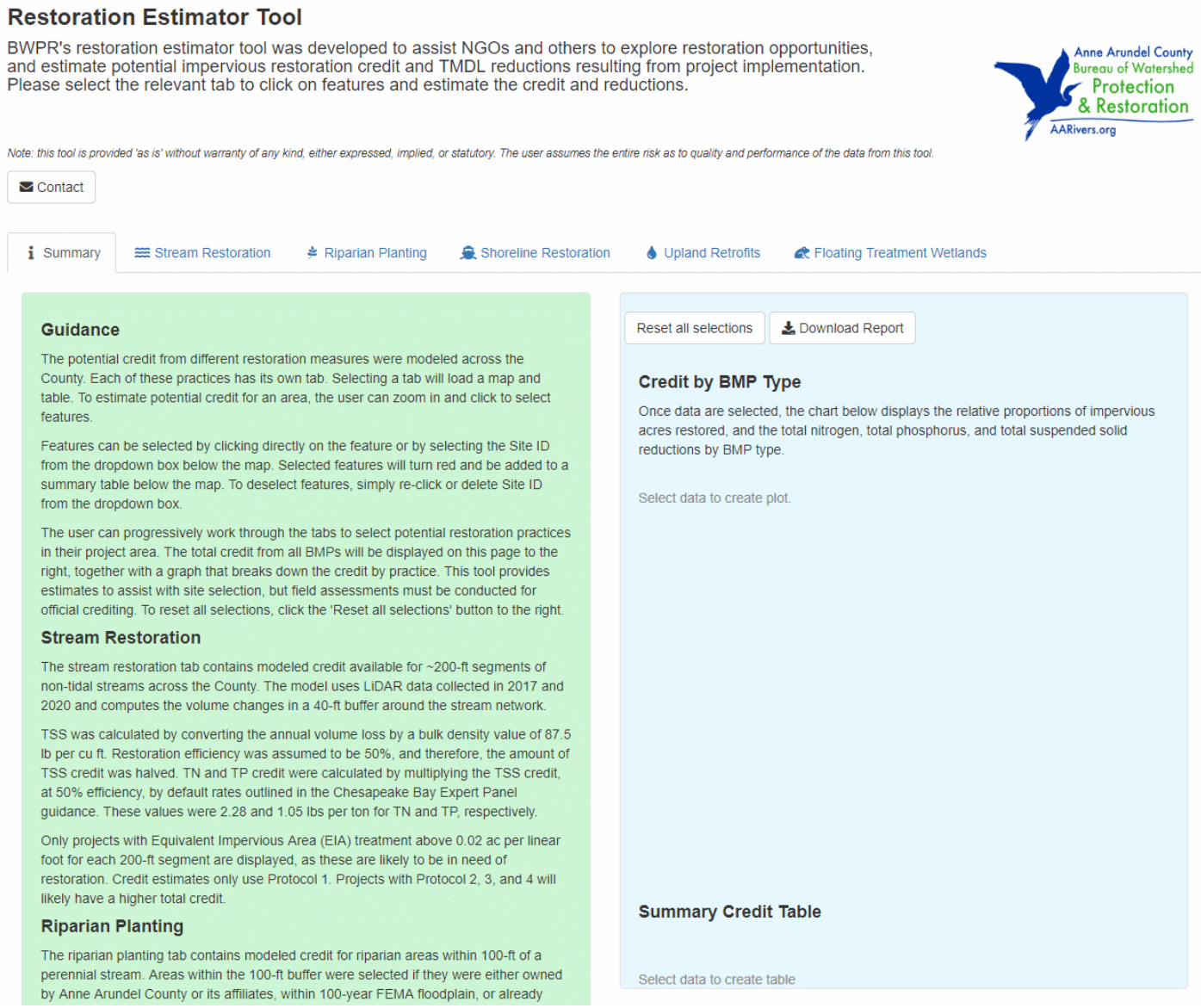
Decision support tools

- Stormwater Best Management Practice implementation is typically reactive and opportunistic
- Decision support tools help find cost-effective opportunities to restore degraded watersheds and meet water quality goals
- Allowing the user to explore modeled data means that restoration opportunities can be scoped without waders



Decision support tools

- Restoration opportunities can be explored by clicking features.
- Selections are added to a summary table below the map, and added to a plot and table on the summary page.
- Reports are generated with Rmarkdown and LaTex. Report sections are conditional on feature selections.



Thanks!

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