

Using  for everything at *NIVA*

You might as well do it right...

# R on Windows – What do we install?



Base R installation.  
Includes the R language and essential packages.

Rtools

Additional non-R functionalities,  
for example to compile packages from source.



Graphical user interface and additional features.  
This is what you use everyday.

# R on Windows – How do we install?



<https://cloud.r-project.org/bin/windows/base/>

Rtools

<https://cloud.r-project.org/bin/windows/Rtools/>



<https://www.rstudio.com/products/rstudio/download/>

# Pro Tip: Use Chocolatey!



• = p

• Like apt

• <https://chocolatey.org>

• <https://chocolatey.org/setup/>

```
Administrator: Windows PowerShell
Windows PowerShell
Copyright (C) 2016 Microsoft Corporation. All rights reserved.

PS C:\WINDOWS\system32> choco upgrade all
Chocolatey v0.10.15
Upgrading the following packages:
all
By upgrading you accept licenses for the packages.
7zip v19.0 is the latest version available based on your source(s).
7zip.install v19.0 is the latest version available based on your source(s).
adobe.reader v2019.012.20035 is the latest version available based on your source(s).
autohotkey.portable v1.1.30.03 is the latest version available based on your source(s).
cccp v2015.10.18 is the latest version available based on your source(s).
chocolatey v0.10.15 is the latest version available based on your source(s).
chocolatey-core.extension v1.3.3 is the latest version available based on your source(s).
docker-desktop v2.1.0.1 is the latest version available based on your source(s).
Firefox v68.0.1 is the latest version available based on your source(s).
gimp v2.10.12 is the latest version available based on your source(s).
gimp.v2.22.0 is the latest version available based on your source(s).
git.install v2.22.0 is the latest version available based on your source(s).
inkscape v0.92.4.20190121 is the latest version available based on your source(s).
InnoSetup v6.0.2 is the latest version available based on your source(s).
julia v1.1.1 is the latest version available based on your source(s).
KB2919355 v1.0.20160915 is the latest version available based on your source(s).
KB2919442 v1.0.20160915 is the latest version available based on your source(s).
miktex v2.9.7152 is the latest version available based on your source(s).
miktex.install v2.9.7152 is the latest version available based on your source(s).
miniconda3 v4.6.14 is the latest version available based on your source(s).
musicbee v3.3.7115 is the latest version available based on your source(s).
notepadplusplus v7.7.1 is the latest version available based on your source(s).
notepadplusplus.install v7.7.1 is the latest version available based on your source(s).
opdf v8.4.2 is the latest version available based on your source(s).
R.Project v3.6.1 is the latest version available based on your source(s).
R.Studio v1.2.1335 is the latest version available based on your source(s).
rtools v3.5.0.4 is the latest version available based on your source(s).
Silverlight v5.1.50907.0 is the latest version available based on your source(s).
slack v4.0.1 is the latest version available based on your source(s).
strawberrypi v5.30.0.1 is the latest version available based on your source(s).
zotero v5.0.73 is the latest version available based on your source(s).

Chocolatey upgraded 0/31 packages.
See the log for details (C:\ProgramData\chocolatey\logs\chocolatey.log).
PS C:\WINDOWS\system32>
```

! OS)

Windows10-

# R on Windows – How do we install?



```
choco install r.project
```



Rtools

```
choco install rtools
```



```
choco install r.studio
```

# R at NIVA – Installing packages



# R at NIVA – Installing packages

- Per default, R installs packages within the Documents folder
- At NIVA, the Documents folder is not physically on your machine, but on the NIVA server
- That's not good for installing and using packages!
- We need to “hack” a custom solution 😊

# R at NIVA – Installing packages



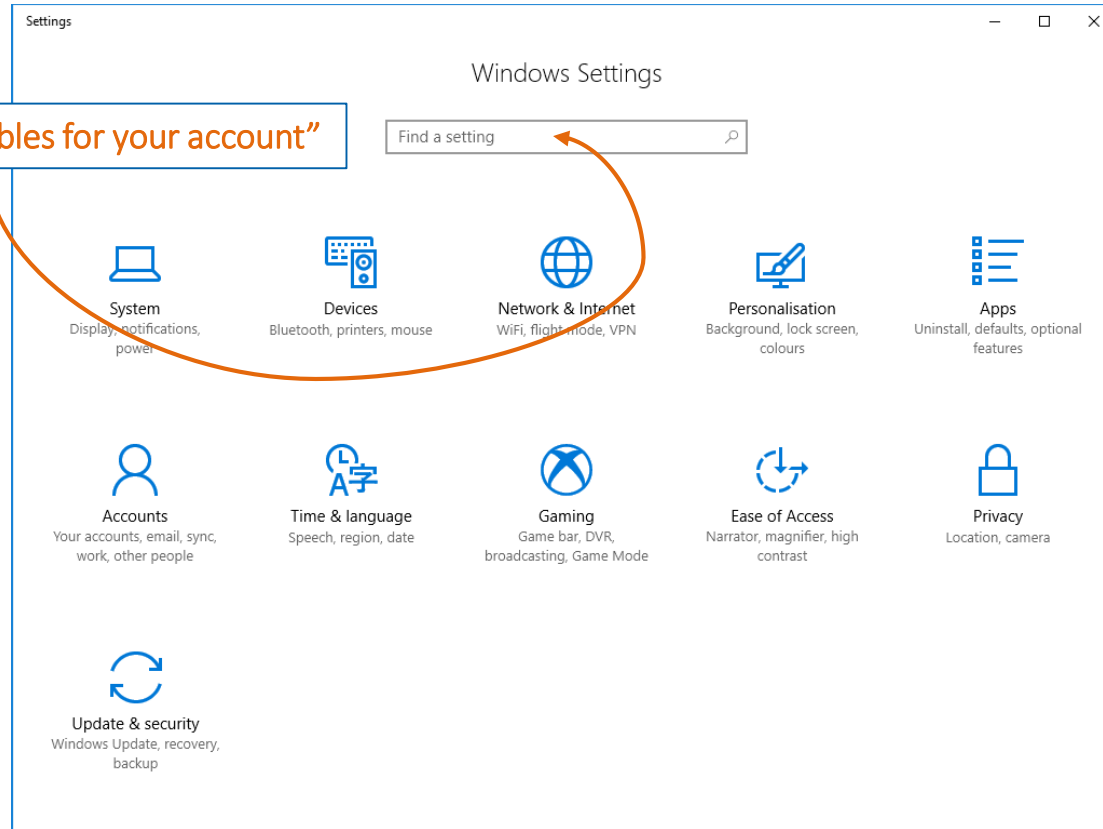


# R at NIVA – Installing packages

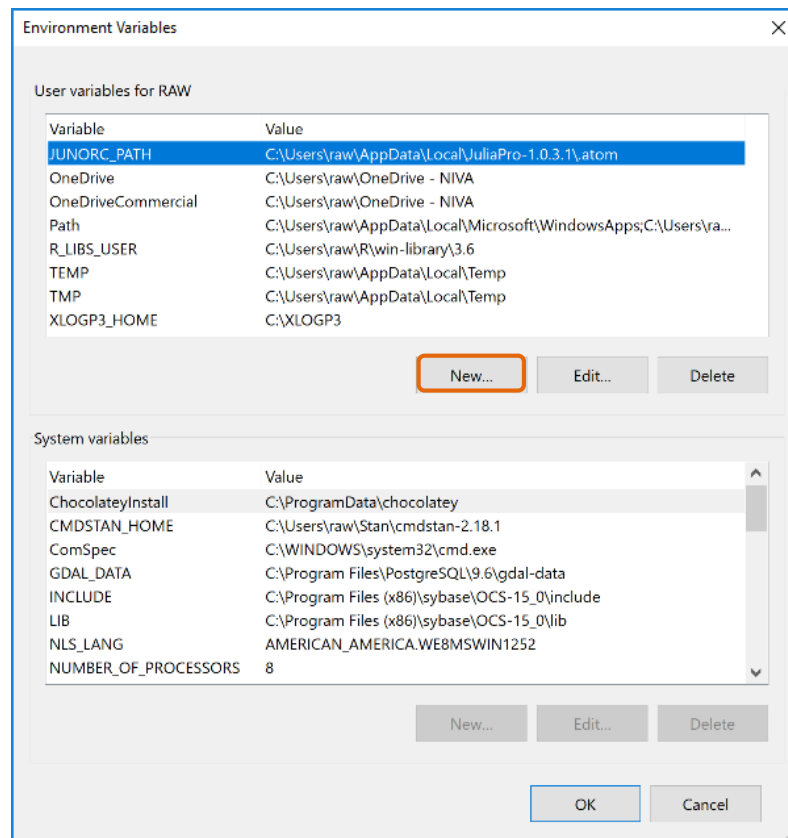
- Defaults:  
C:\Program Files\R\R-3.6.0\library  
C:\Users\Documents\[your user name]\R\win-library\3.6
- **Smart:** C:\Users\[your user name]\R\win-library
- But how does R know where to install packages?
- **R\_LIBS\_USER**

# R at NIVA – Installing packages

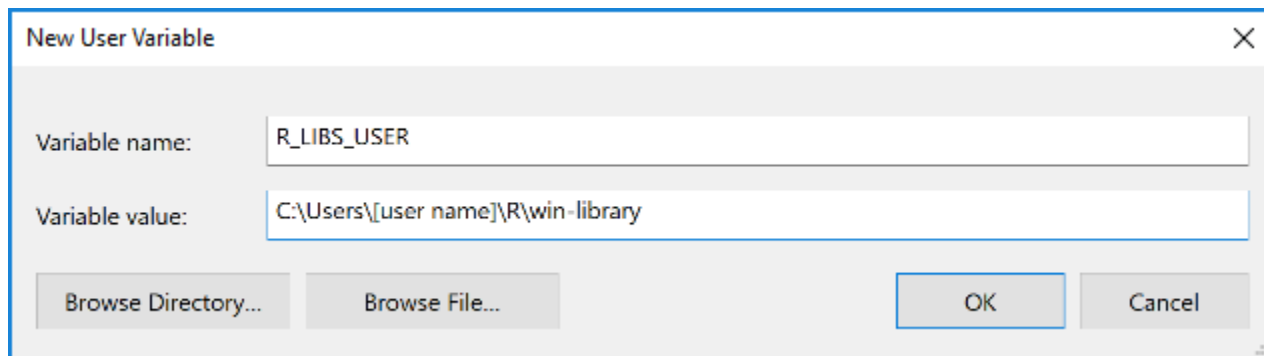
“Edit environment variables for your account”



# R at NIVA – Installing packages



# R at NIVA – Installing packages



New User Variable

Variable name: R\_LIBS\_USER

Variable value: C:\Users\[user name]\R\win-library

Browse Directory... Browse File... OK Cancel

# R at NIVA – What do we *use*?



Rtools



# R at NIVA – Recommendations

- Use RStudio

# R at NIVA – Recommendations

The screenshot shows the RStudio IDE interface. Four orange-bordered boxes with blue text are overlaid on the interface to highlight specific areas:

- Script**: Points to the main editor window where R code is written.
- Environment *et al.***: Points to the Environment pane, which shows the current environment (Global Environment) and its contents.
- Console**: Points to the Console pane at the bottom left, which displays the output of R commands.
- Packages, Plots *et al.***: Points to the Packages pane at the bottom right, which lists installed and available packages.

The Console pane shows the following text:

```
R version 3.6.1 (2019-07-05) -- "Action of the Toes"
Copyright (C) 2019 The R Foundation for Statistical Computing
Platform: x86_64-w64-mingw32/x64 (64-bit)

R is free software and comes with ABSOLUTELY NO WARRANTY.
You are welcome to redistribute it under certain conditions.
Type 'license()' or 'licence()' for distribution details.

R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()'
'help.start()' for an HTML browser interface or
type 'q()' to quit R.

> |
```

The Packages pane shows a list of installed and available packages:

Name	Description	Version
System Library		
<input type="checkbox"/> abind	Combine Multidimensional Arrays	1.4-5
<input type="checkbox"/> askpass	Safe Password Entry for R, Git, and SSH	1.1
<input type="checkbox"/> assertthat	Easy Pre and Post Assertions	0.2.1
<input type="checkbox"/> backports	Reimplementations of Functions Introduced Since R-3.0.0	1.1.4
<input checked="" type="checkbox"/> base	The R Base Package	3.6.1
<input type="checkbox"/> base64enc	Tools for base64 encoding	0.1-3
<input type="checkbox"/> bayesplot	Plottings for Bayesian Models	1.7.0
<input type="checkbox"/> bayestestR		0.2.5
<input type="checkbox"/> betareg		3.1-2
<input type="checkbox"/> BH		1.69.0-1
<input type="checkbox"/> bit	A Class for Vectors of 1-Bit Booleans	0.4-2
<input type="checkbox"/> bit64	A S3 Class for Vectors of 64bit Integers	1.1-14
<input type="checkbox"/> bitops	Bitwise Operations	0.9-7
<input type="checkbox"/> blob	A Simple S3 Class for Representing Vectors of Binary Data (BLOBs)	1.0-6
<input type="checkbox"/> bmd	Benchmark dose estimation for dose-response data	1.2.0
<input type="checkbox"/> boot	Bootstrap Functions (Originally by Angelo Canty for S)	1.1.0
<input type="checkbox"/> brew	Templating Framework for Report Generation	1.3-22
<input type="checkbox"/> bridgesampling	Bridge Sampling for Marginal Likelihoods and Bayes Factors	1.0-6
<input type="checkbox"/> brms	Bayesian Regression Models using 'Stan'	0.7-2

# R at NIVA – Recommendations

- Use RStudio
- Use RStudio projects (no more `setwd()`!)



# R at NIVA – Recommendations

“New Project...”

The screenshot shows the RStudio interface with the 'New Project...' dialog box open. The dialog box has three tabs: 'New Project...', 'New Environment', and 'New Data Source'. The 'New Project...' tab is selected, showing a list of projects. The 'Environment' pane on the right shows 'Global Environment' with 'Environment is empty'. The 'Packages' pane at the bottom shows a list of installed and available packages.

**Console Output:**

```
R version 3.6.1 (2019-07-05) -- "Action of the Toes"
Copyright (C) 2019 The R Foundation for Statistical Computing
Platform: x86_64-w64-mingw32/x64 (64-bit)

R is free software and comes with ABSOLUTELY NO WARRANTY.
You are welcome to redistribute it under certain conditions.
Type 'license()' or 'licence()' for distribution details.

R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

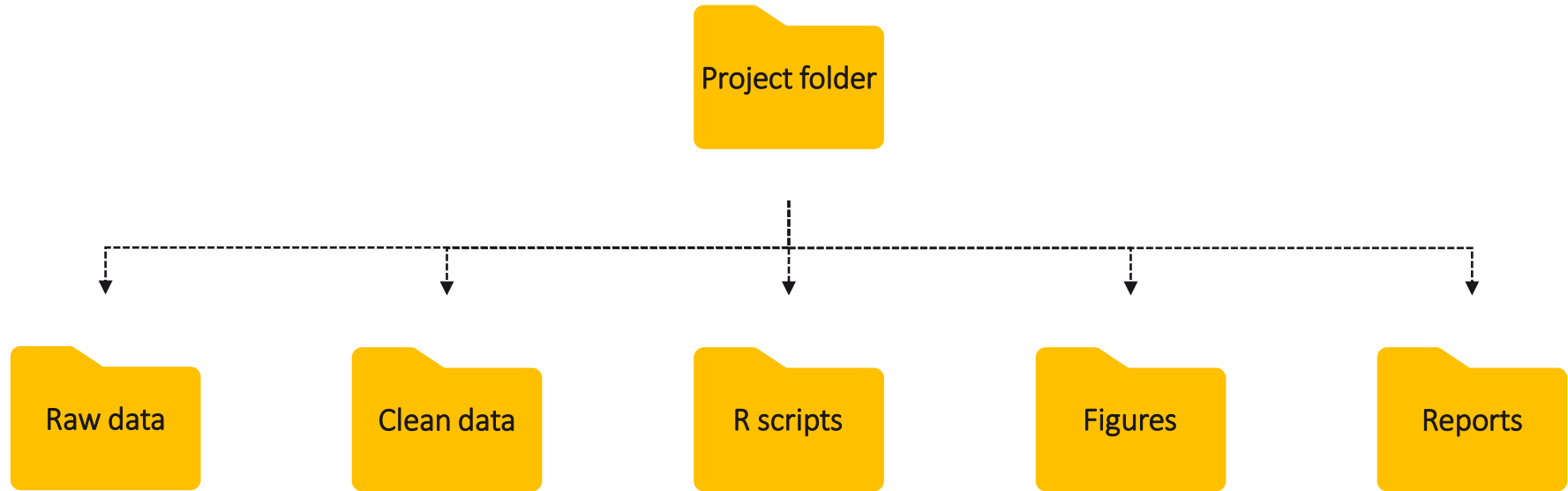
> |
```

**Environment:** Global Environment (empty)

**Packages:**

Name	Description	Version
abind	Combine Multidimensional Arrays	1.4-5
askpass	Safe Password Entry for R, Git, and SSH	1.1
assertthat	Easy Pre and Post Assertions	0.2.1
backports	Reimplementations of Functions Introduced Since R-3.0.0	1.1.4
base	The R Base Package	3.6.1
base64enc	Tools for base64 encoding	0.1-3
bayesplot	Plotting for Bayesian Models	1.7.0
bayestestR	Understand and Describe Bayesian Models and Posterior Distributions	0.2.5
betareg	Beta Regression	3.1-2
BH	Boost C++ Header Files	1.69.0-1
bit	Bitwise Operations	0.4-2
bit64	A Class for Vectors of 64-bit Integers	1.1-14
bitops	Bitwise Operations	0.9-7
blob	A Simple S3 Class for Representing Vectors of Binary Data (BLOBs)	1.0-6
bmd	Benchmark dose estimation for dose-response data	1.2.0
boot	Bootstrap Functions (Originally by Angelo Canty for S)	1.1.0
brew	Templating Framework for Report Generation	1.3-22
bridgesampling	Bridge Sampling for Marginal Likelihoods and Bayes Factors	1.0-6
brms	Bayesian Regression Models using 'Stan'	0.7-2

# R at NIVA – Recommendations



# R at NIVA – Recommendations

- Use RStudio
- Use RStudio projects (no more `setwd()`!)
- Annotate your code!

# R at NIVA – Recommendations

## Bad script

```
rtnorm <- function(n, mean = 0, sd = 1, lower = -Inf, upper = Inf, inclusive = TRUE, ...) {  
  pre_result <- rnorm(n = n, mean = mean, sd = sd)  
  
  if (inclusive) {  
    result <- pre_result[which(pre_result >= lower & pre_result <= upper)]  
    while (length(result) < n) {  
      result <- c(result, rtnorm(n = n - length(result), mean = mean, sd = sd))  
      result <- result[which(result >= lower & result <= upper)]  
    }  
  }  
  
  if (!inclusive) {  
    result <- pre_result[which(pre_result > lower & pre_result < upper)]  
    while (length(result) < n) {  
      result <- c(result, rtnorm(n = n - length(result), mean = mean, sd = sd))  
      result <- result[which(result > lower & result < upper)]  
    }  
  }  
  
  result  
}
```

# R at NIVA – Recommendations

Okay script

```
## Load packages
library(DBI)
library(odbc)
library(keyring)
library(tidyverse)
library(dbplyr)

## Connect to database
RADBDEV <- dbConnect(odbc(),
                     dsn = "RADBDEV",
                     UID = key_get(service = "RADBDEV username", username = Sys.getenv("USERNAME")),
                     PWD = key_get(service = "RADBDEV password", username = Sys.getenv("USERNAME")))

## Get relevant kaldvellfjord case study
exposure_data <- tbl(RADBDEV, in_schema("RA_EL", "RA_ENVIRONMENTAL_CON")) %>%
  filter(CAMPAIGN == "kaldvellfjorden",
         SAMPLE_MATRIX == "Salt water",
         FRACTION == "LMM",
         STRESSOR_TYPE == "Pollutant",
         is.na(MEASURED_FLAG),
         DWH_VALID == 1) %>%
  select(SITE_CODE, SAMPLE_DATE, CHEMICAL_ID, CHEMICAL_NAME, MEASURED_VALUE, MEASURED_UNIT) %>%
  collect() %>%
  mutate(SAMPLE_DATE = as.Date(SAMPLE_DATE),
         CHEMICAL_ID = as.integer(CHEMICAL_ID),
         CHEMICAL_NAME = str_to_title(CHEMICAL_NAME))

## Extract Chemical IDs
chids <- exposure_data %>%
  select(CHEMICAL_ID, CHEMICAL_NAME) %>%
  distinct()
```

## Good report

### Walk Through Of A Case Study

The following is a walkthrough of cumulative risk assessment procedures *without* using the `nctpr` package for convenience, but it follows all steps manually. Please note that as of 2019-06-27 the user effect data and parent compounds are *not* included in this walkthrough.

#### Install and load necessary packages

This walkthrough largely depends on data wrangling functionalities of packages contained inside the `tidyverse` package collection, like `dbplyr`, `dplyr`, `stringr` and `tidyr`. The packages `DBI` and `odbc` provide a database interface and driver information, respectively. Finally, the `keyring` package is used to access credentials (username and password) for NIVA's Risk Assessment database (RAdb)

```
install.packages(c("tidyverse", "DBI", "odbc", "keyring"))
```

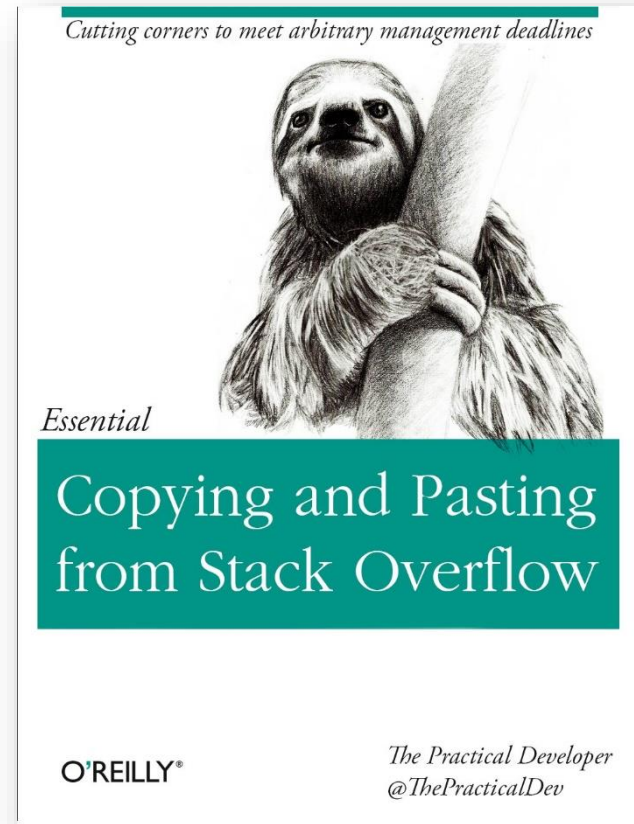
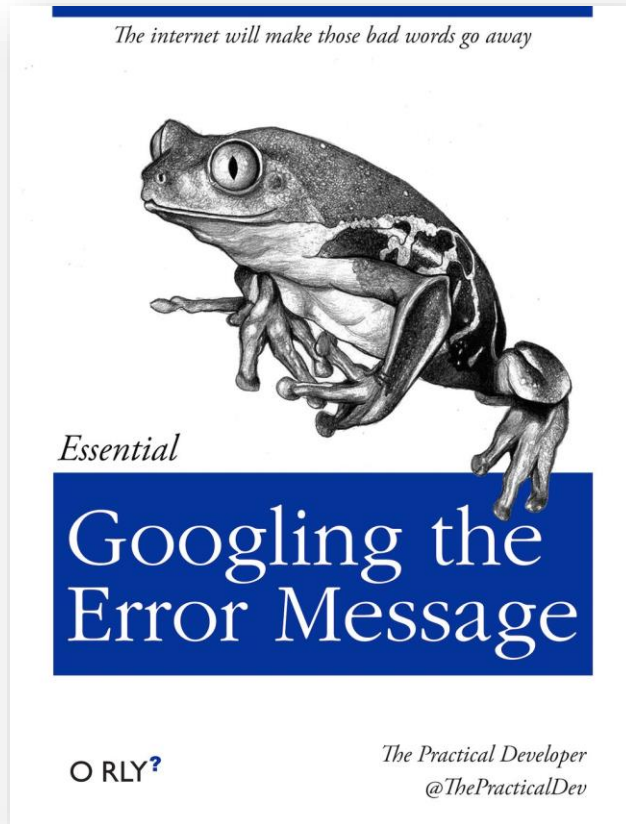
Loading the `tidyverse` package collection automatically loads most of the relevant packages for data wrangling. Only the database-specific `dbplyr` package needs to be loaded explicitly in addition.

```
library(DBI)
library(odbc)
library(keyring)
library(tidyverse)
library(dbplyr)
```

# R at NIVA – Recommendations

- Use RStudio
- Use RStudio projects (no more `setwd()`!)
- Annotate your code!
- Use Google and Stack Overflow!

# R at NIVA – Recommendations





# R at NIVA – What do *YOU* want?

- Markdown reports?
- Git/GitHub integration?
- Database access?
- Data crunching?
- Visualizations?
- Statistics?