

Introduction to Version Control with a focus on Git

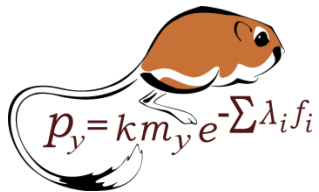
Go back in time with....
Version Control



HELLO

my name is

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danmcglinn@gmail.com

<http://mcglinn.web.unc.edu>

"FINAL".doc



FINAL.doc!



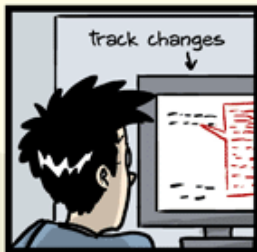
FINAL_rev.2.doc



FINAL_rev.6.COMMENTS.doc



FINAL_rev.8.comments5.
CORRECTIONS.doc



FINAL_rev.18.comments7.
corrections9.MORE.30.doc



FINAL_rev.22.comments49.
corrections.10. #@\$%WHYDID
ICOMETOGRADSCHOOL?????.doc

Outline

- What is Version Control
- Why we need it in science
- Git as a version control system

Version Control

- System to manage different versions of a single file

Working Copy

my_code.txt

History of Edits

my_code.txt

my_code.txt

my_code.txt

Time



Version Control

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Working Copy

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Edits

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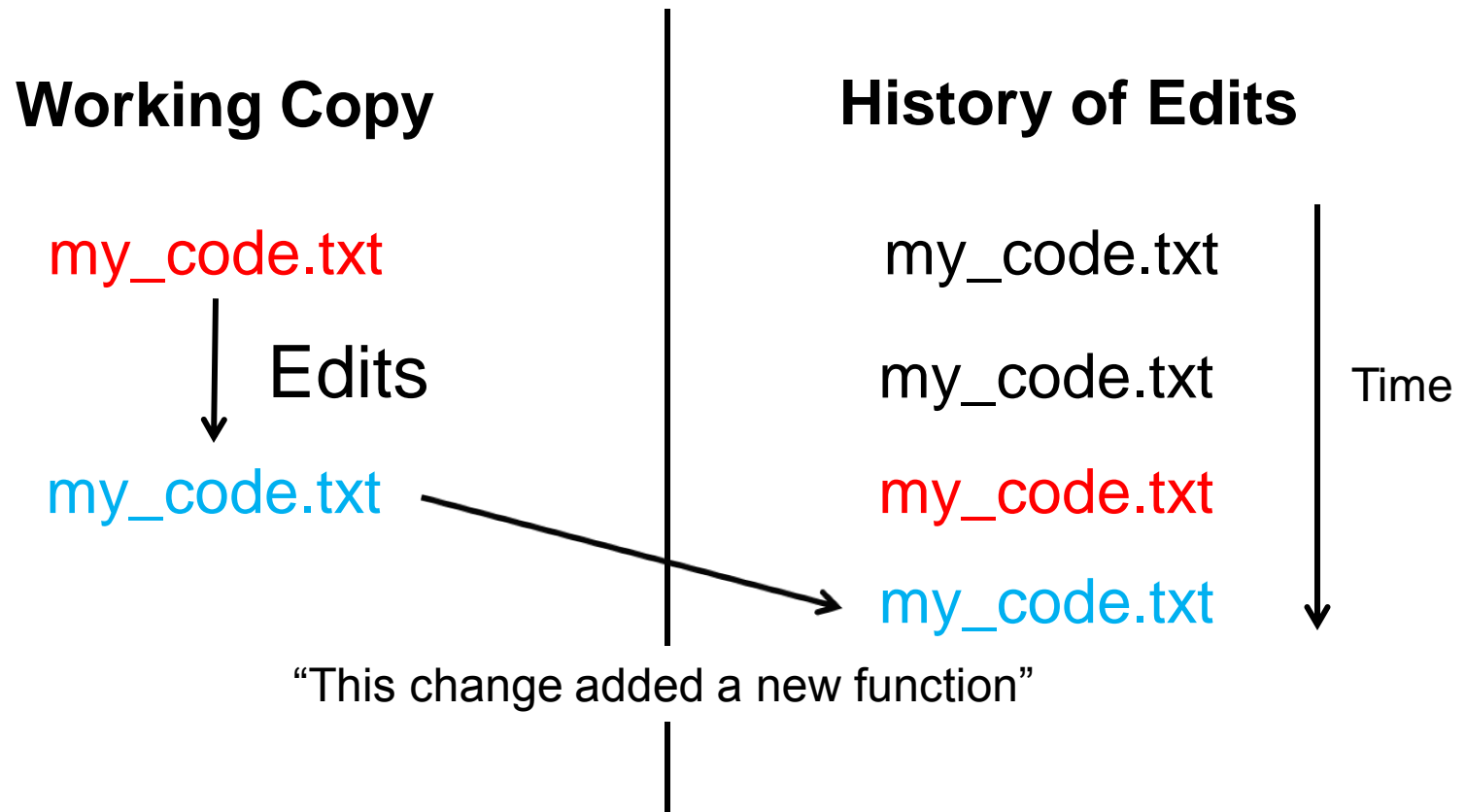
my_code.txt

Time



Version Control

- Ability to annotate changes (e.g., Lab Notebook)



Version Control

- Enables the ability to retrace edits to revert the file to an older version.

Working Copy

my_code.txt

my_code.txt

History of Edits

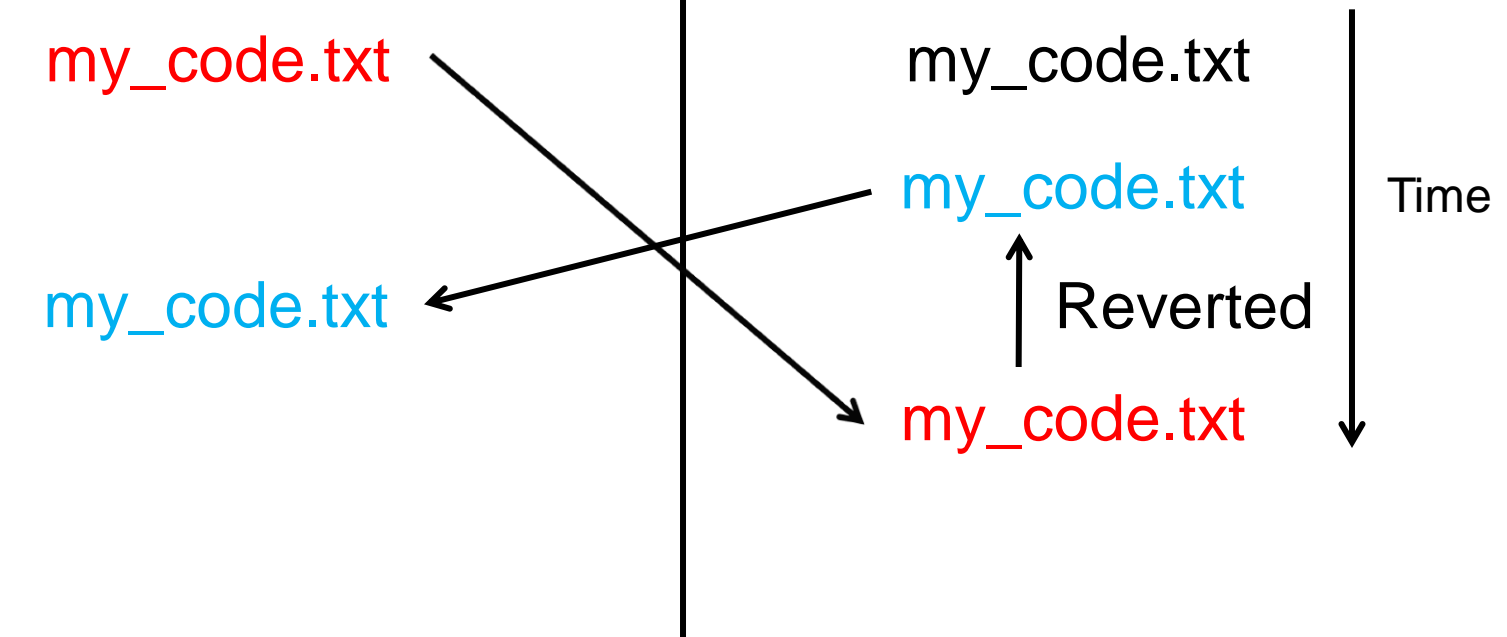
my_code.txt

my_code.txt

my_code.txt

Reverted

Time



Why Do We Need This?

- Reproducibility → like a lab notebook
- Personal workflow
 - Final.doc example
- Collaborative workflow
 - Allows a team of scientists contribute simultaneously to a project without fear of overwriting each other or breaking something

Why Git?

- Free Open Source
- Popular with active user-base
- Decentralized and distributed
- Requires only infrequent connection to server

Ram, K. - Git can facilitate greater reproducibility and increased transparency in science. <http://dx.doi.org/10.6084/m9.figshare.153821>

Local Git Structure

Working

my_code.txt

Staging

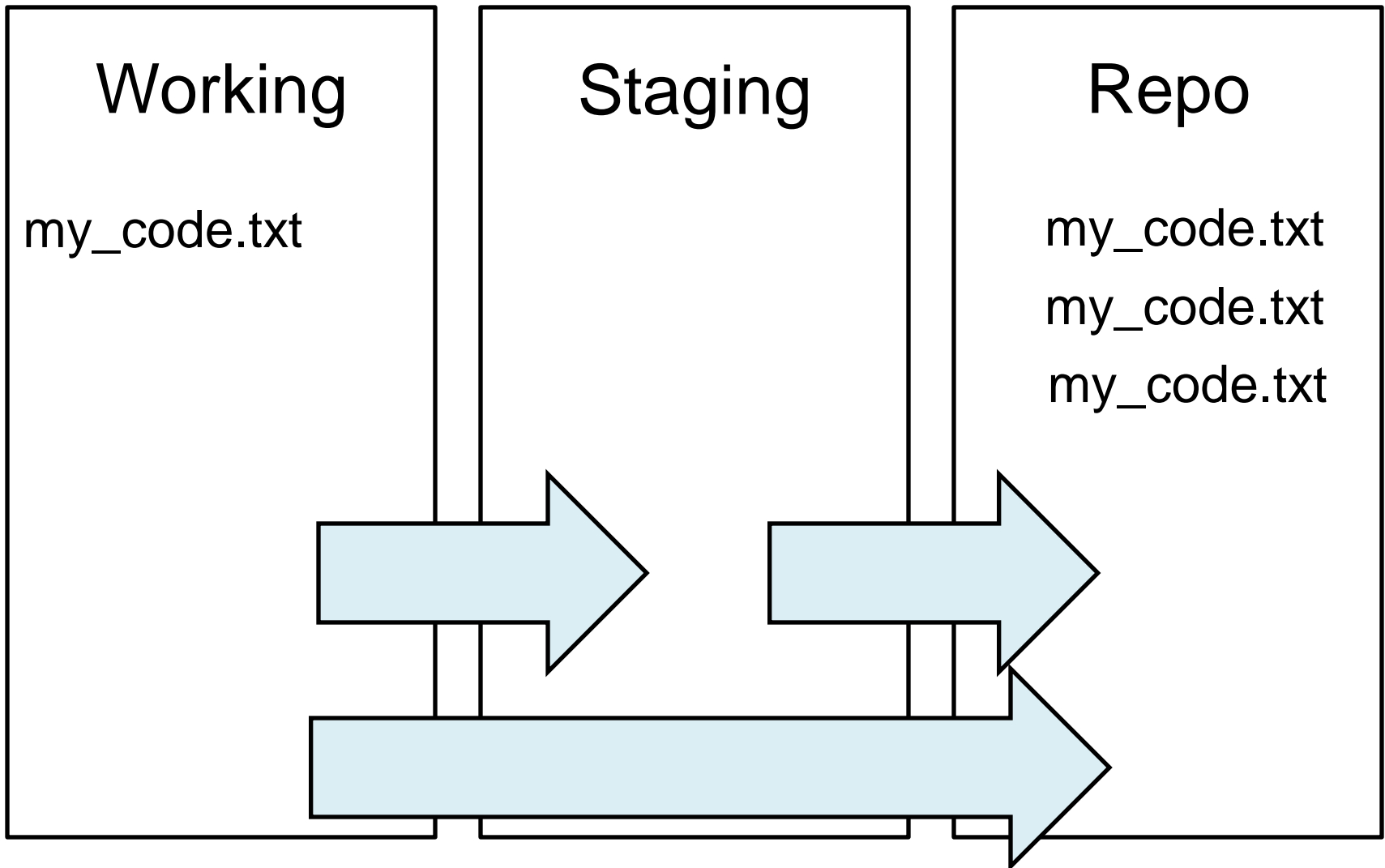
Repo

my_code.txt

my_code.txt

my_code.txt

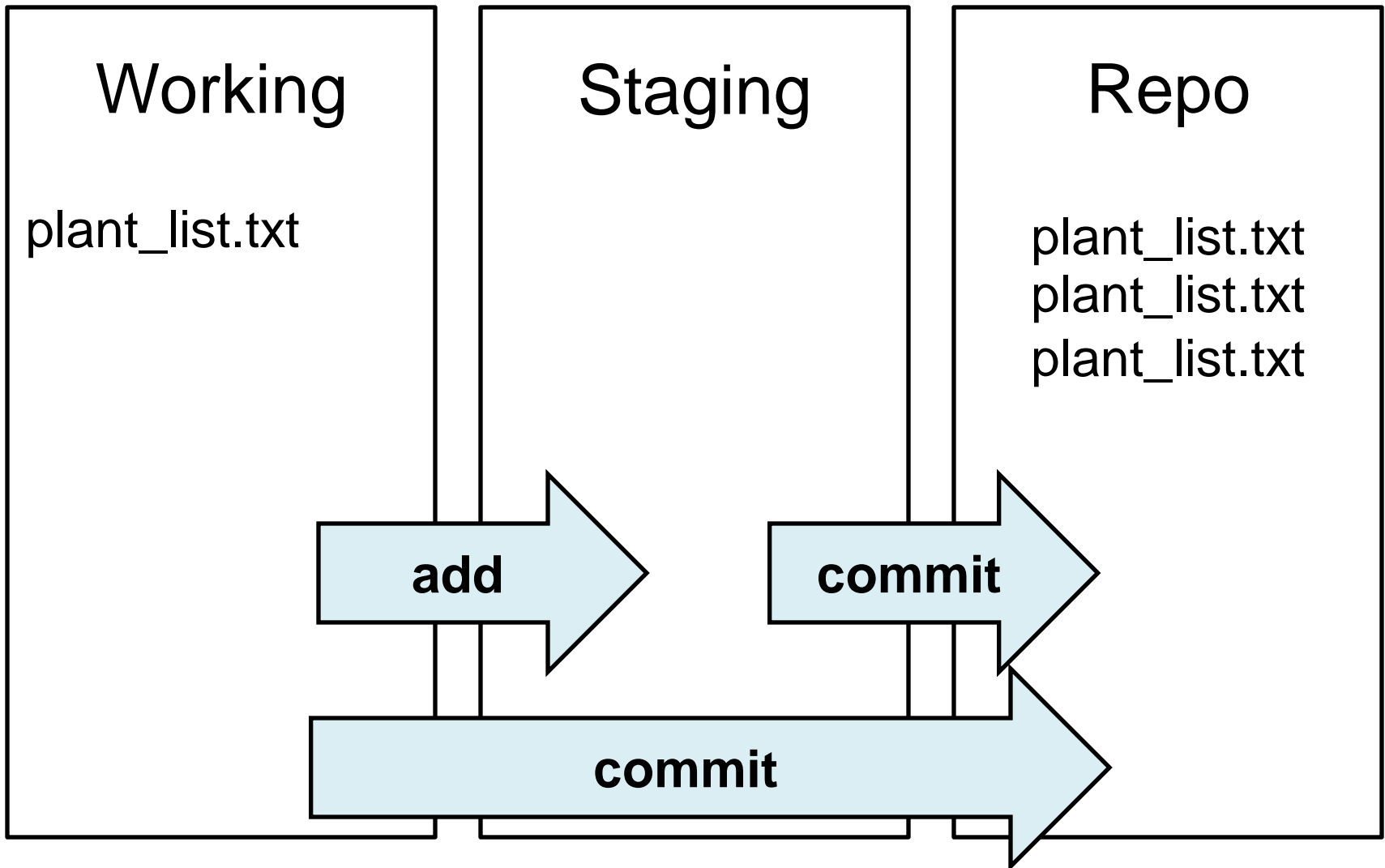
Local Git Workflow



First Commit: Follow Along Demo



Local Git Workflow



Staging Files

```
$ git add .
```

- Stages all new or modified files in the working directory

```
$ git add <file_name>
```

- Stages a specific new or modified file

Committing Files

\$ `git commit -m "Description of changes"`

- Save a snapshot of all staged files to the repo

\$ `git commit <file_name> -m "Description of changes"`

- Save a snapshot of a specific file to the repo

Meaningful Commit Messages

- First line should be a short description
 - 50 characters
 - Informative → what the commit does
 - Like a subject of an email
- Additional text should:
 - include motivation for the change
 - contrast its implementation with previous behavior
- Should be in present tense






Where you don't want to be...

www.commitlogsfromlastnight.com

Import to Mendeley wiki ecology postings ... Positions - ESA Physiol... Google Scholar weecology's wiki / Fro... RStudio Sign In danmcglinn — Bitbuc... weecology (Weecology) dmcglinn's Profile - Gi...

Commit Logs From Last Night
because real hackers pivot two hours before their demo

Fuckin' fork me

	03/20/13 10:56 PM	fuck cells
	03/20/13 10:48 PM	fuck it, stay with pygments for now
	03/20/13 10:45 PM	Still fucking around with getting fields right
	03/20/13 10:40 PM	Fucking method visibility in PHP!!! At least make it consistent in different versions! Made all public!
	03/20/13 10:39 PM	shits broke

This thing tweets at @CLFLN

Created by @abestanway

Bookkeeping

\$ `git init <repo_name>`

- Creates git repo

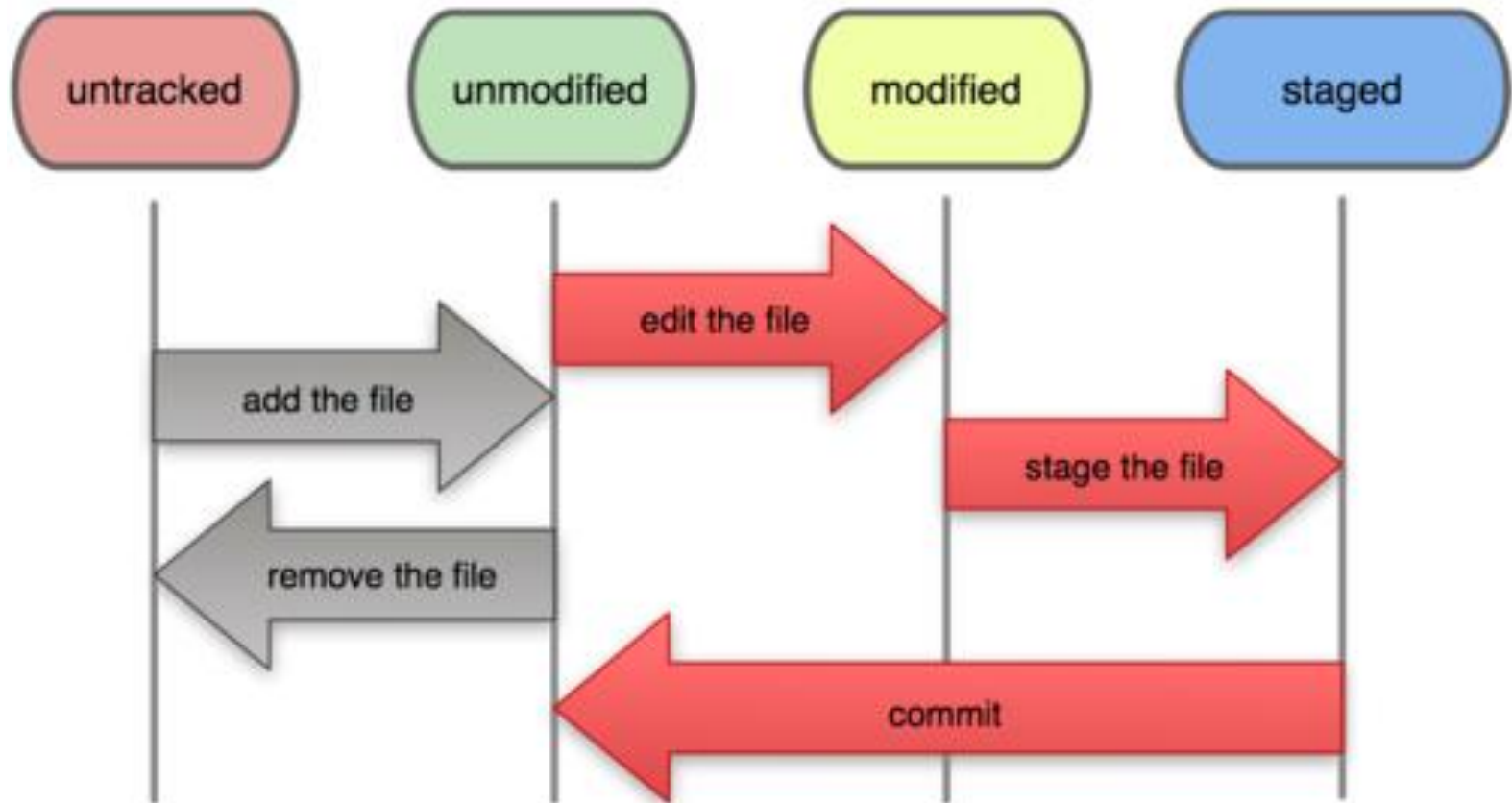
\$ `git status`

- Describes current status of any files in the git repo
 - Untracked
 - Modified
 - Staged

\$ `git log`

- Provides history of commits to the repo

File Status Lifecycle



First Commit: Do It Yourself



- Add new observations to **plant_list.txt**
- Create a new file called **site_list.txt**
 - Add this to the repo

Move and Remove Files: Follow Along Demo



Moving and Removing Files

```
$ git mv <old_file_name> <new_file_name>
```

- Renames or moves a file in the repo to a new location

```
$ git rm <file_name>
```

- Removes a file from the repo

Move and Remove Files: Do It Yourself



- Remove the file **habitat_list.txt**
- Create a directory called **data**
- Move the file **plant_list.txt** to the directory **data**

Finding What's Different: Follow Along Demo

Go away, Arial.

a

But, Helvetica!

a

Finding Differences

```
$ git diff
```

- Describes all differences for all modified files with respect to the last commit

```
$ git diff <file_name>
```

```
$ git diff <commit_hash_id>
```


Finding What's Different: Do It Yourself

Go away, Arial.

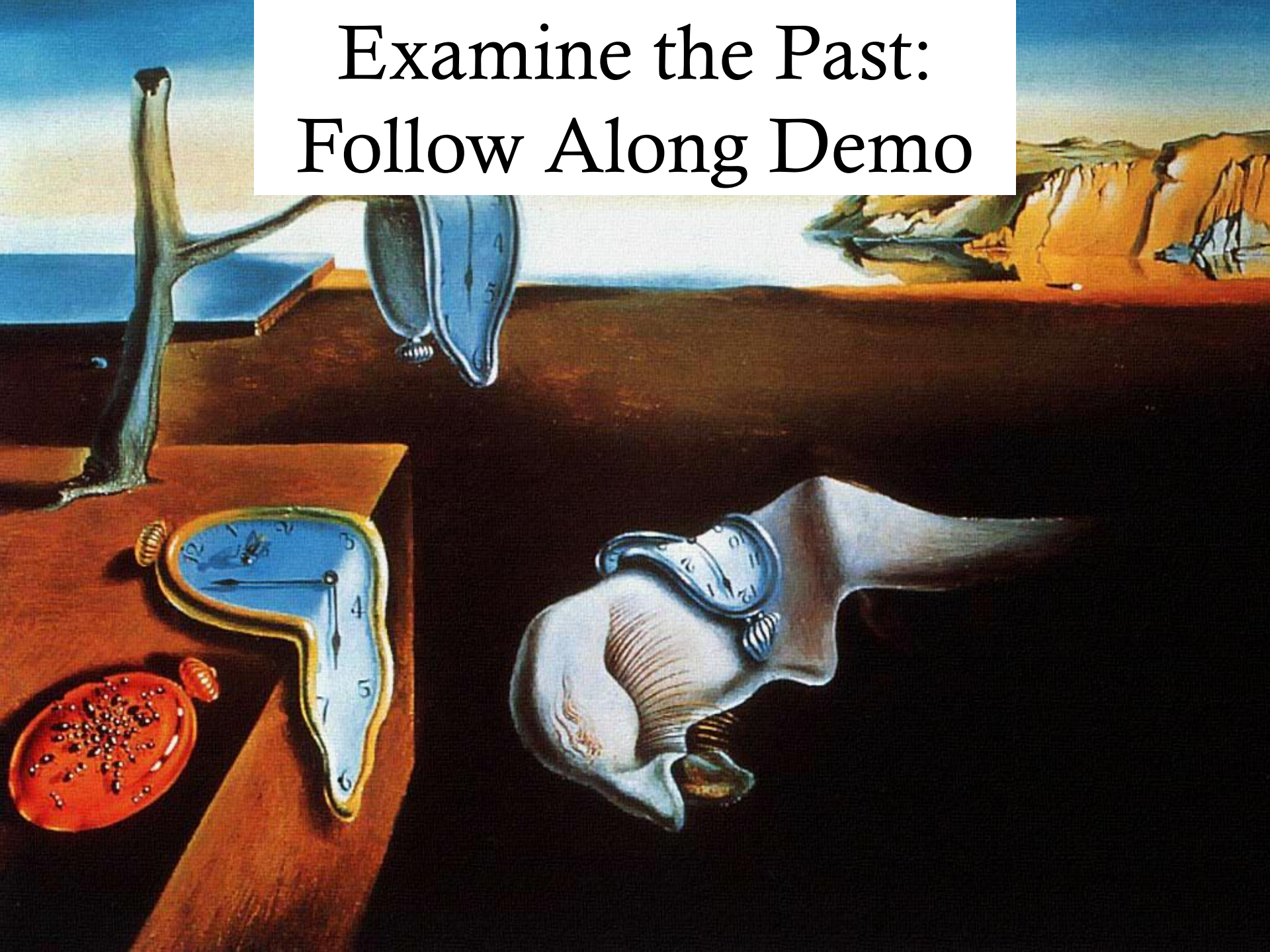
a

But, Helvetica!

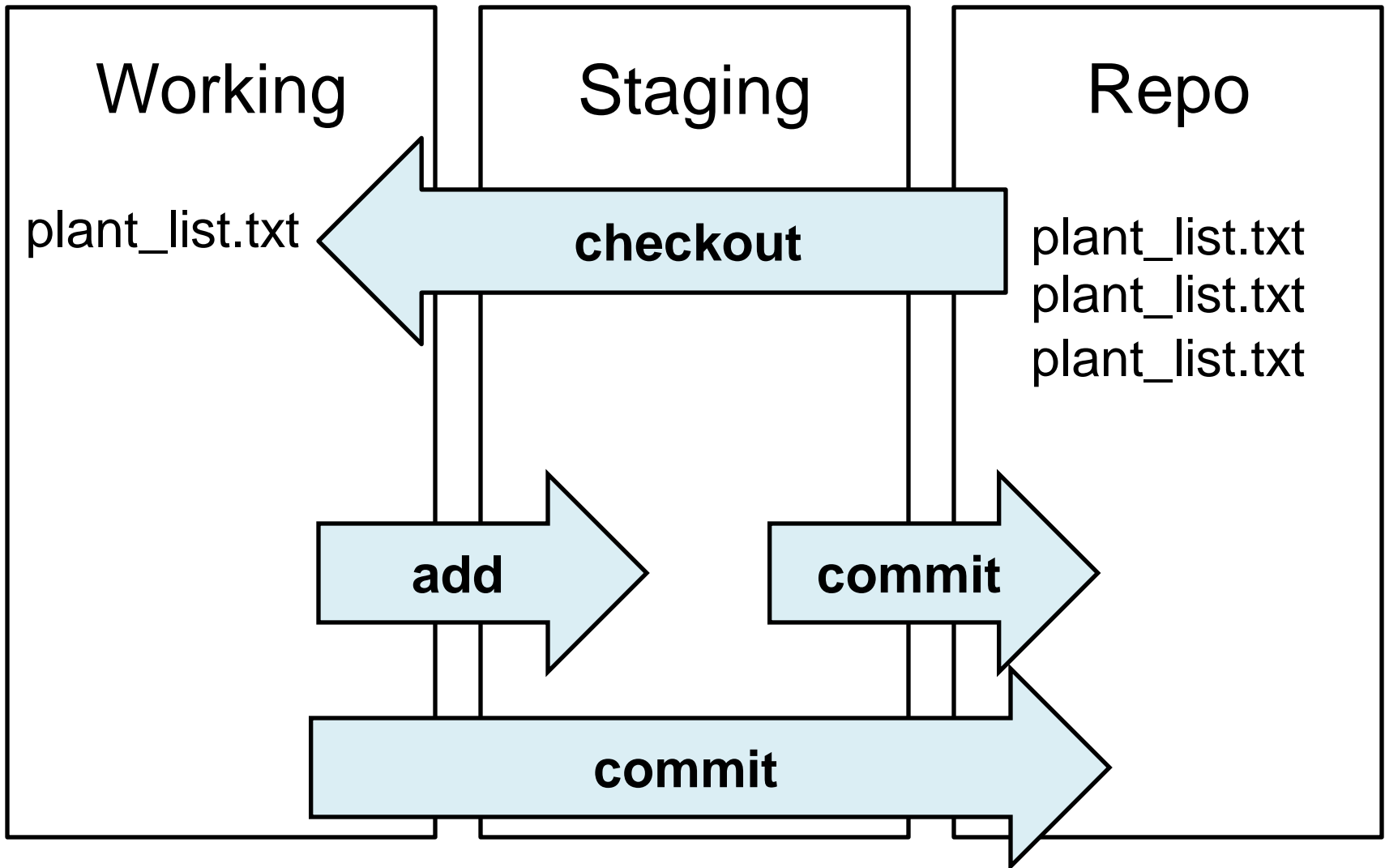
a

- Modify **plant_list.txt** by adding a species to it
- Examine using `git diff` to examine what you changed
- Examine how your changes differ from the initial creation of **plant_list.txt**

Examine the Past: Follow Along Demo



Local Git Workflow




Checkout

\$ `git checkout <commit_hash_id>`

- Superficially returns the working directory to its state from a previous commit
- Visibly rolls back all intermediate commits, but does not delete those changes
- Detaches HEAD

\$ `git checkout master`

- Returns HEAD to the master branch and returns the working directory to the state of the last commit



Examine the Past: Do It Yourself

- Change **habitat_list.txt** and commit your change.
- You decide you would like to see the old **habitat_list.txt**
- Checkout the commit just prior to when you removed it
- Examine the status of your repo and **habitat_list.txt**
- Return to the master branch

Turn Back Time: Follow Along Demo



Recovering Previous File States

\$ `git checkout <file_name>`

- Rolls back any unstaged changes to the last commit state

\$ `git reset <file_name>`

- Unstages changes but does not omit them

\$ `git reset --hard <file_name>`

- Unstages changes and omits them

\$ `git reset <commit_hash_id>`

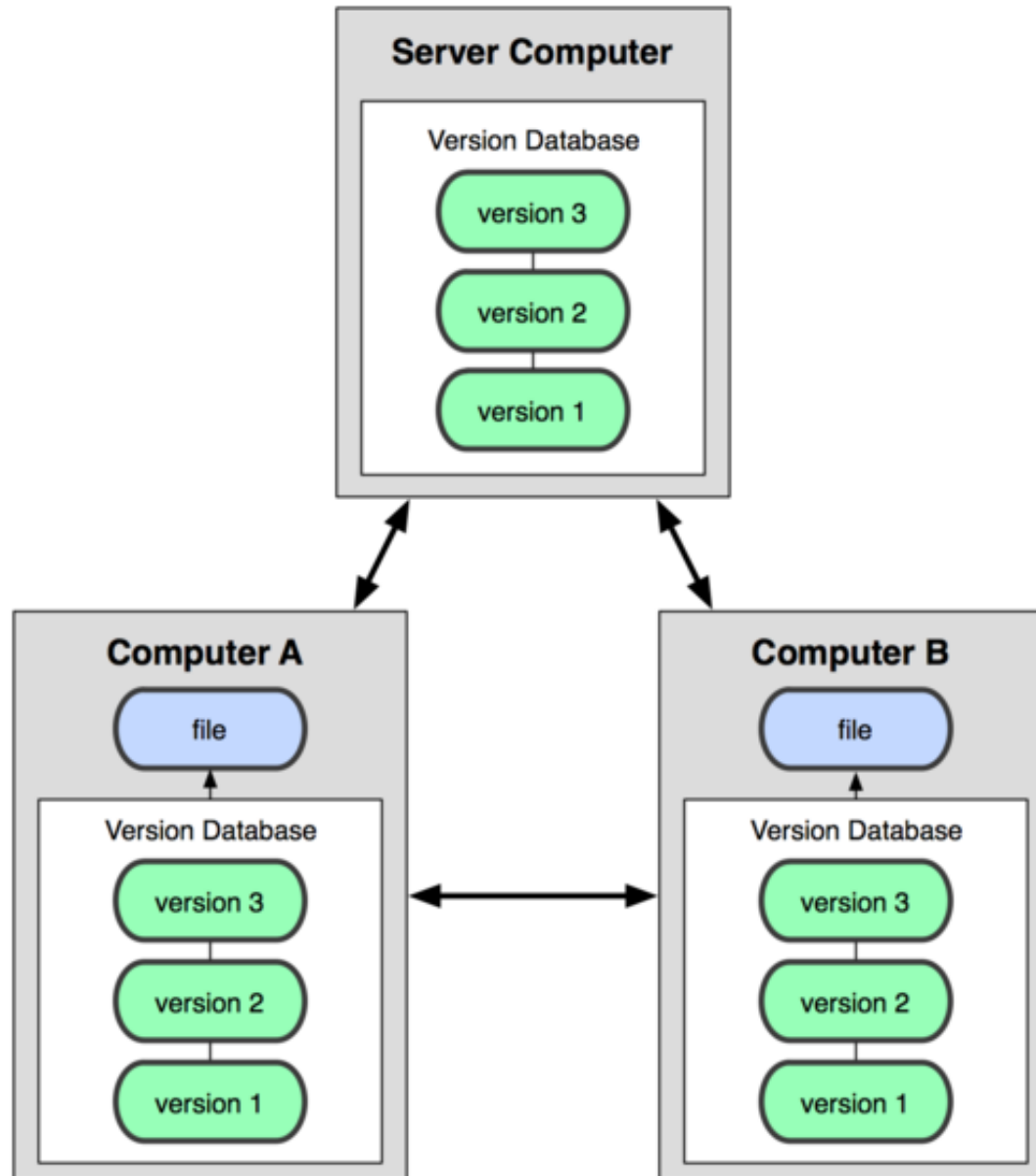
- Rolls back committed changes but does not omit them for all files to a specific version of the repo



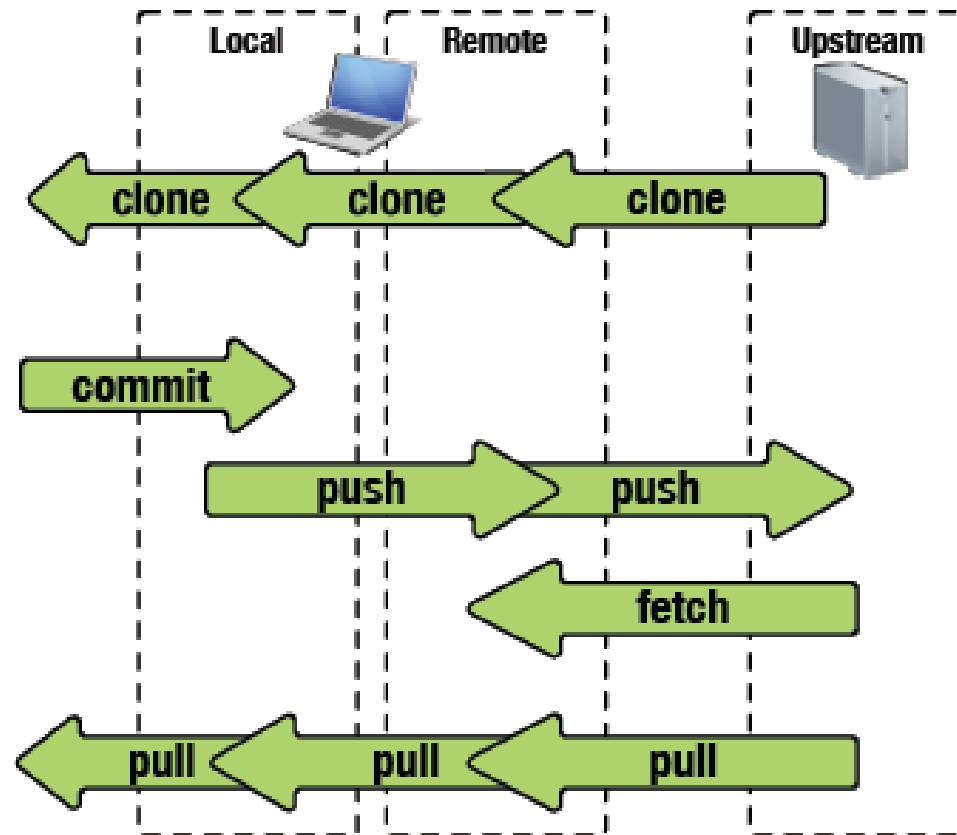
Turn Back Time: Do It Yourself

- Modify **plant_list.txt**
- Return **plant_list.txt** to the last commit state
- Modify **plant_list.txt** and stage it
- Return **plant_list.txt** to the last commit state
- Return the working directory to when **habitat_list.txt** existed

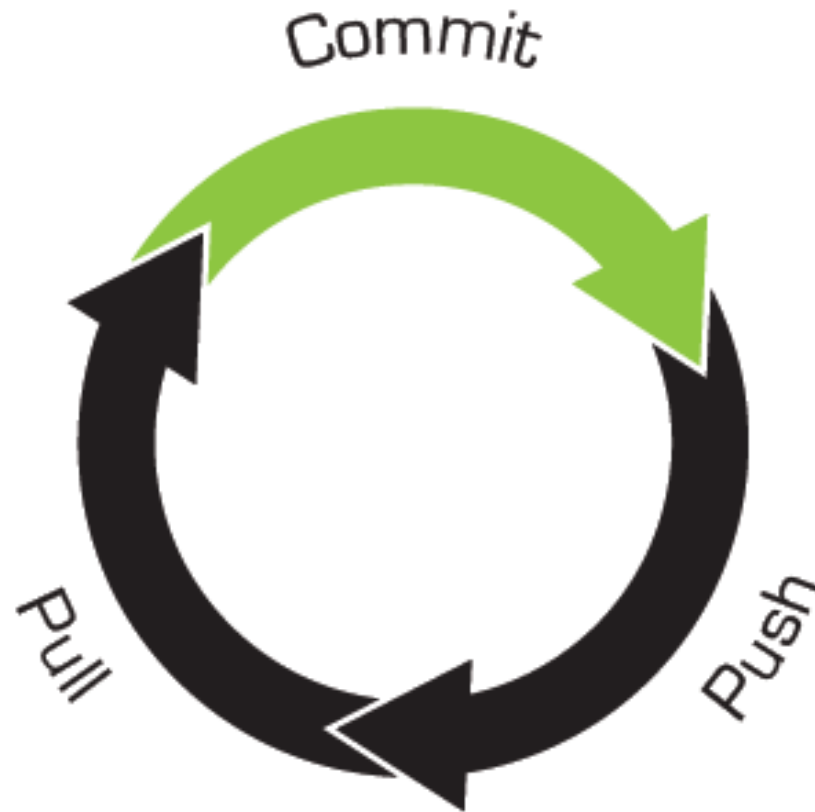
Git Local & Remote Structure



Git Remote Workflow



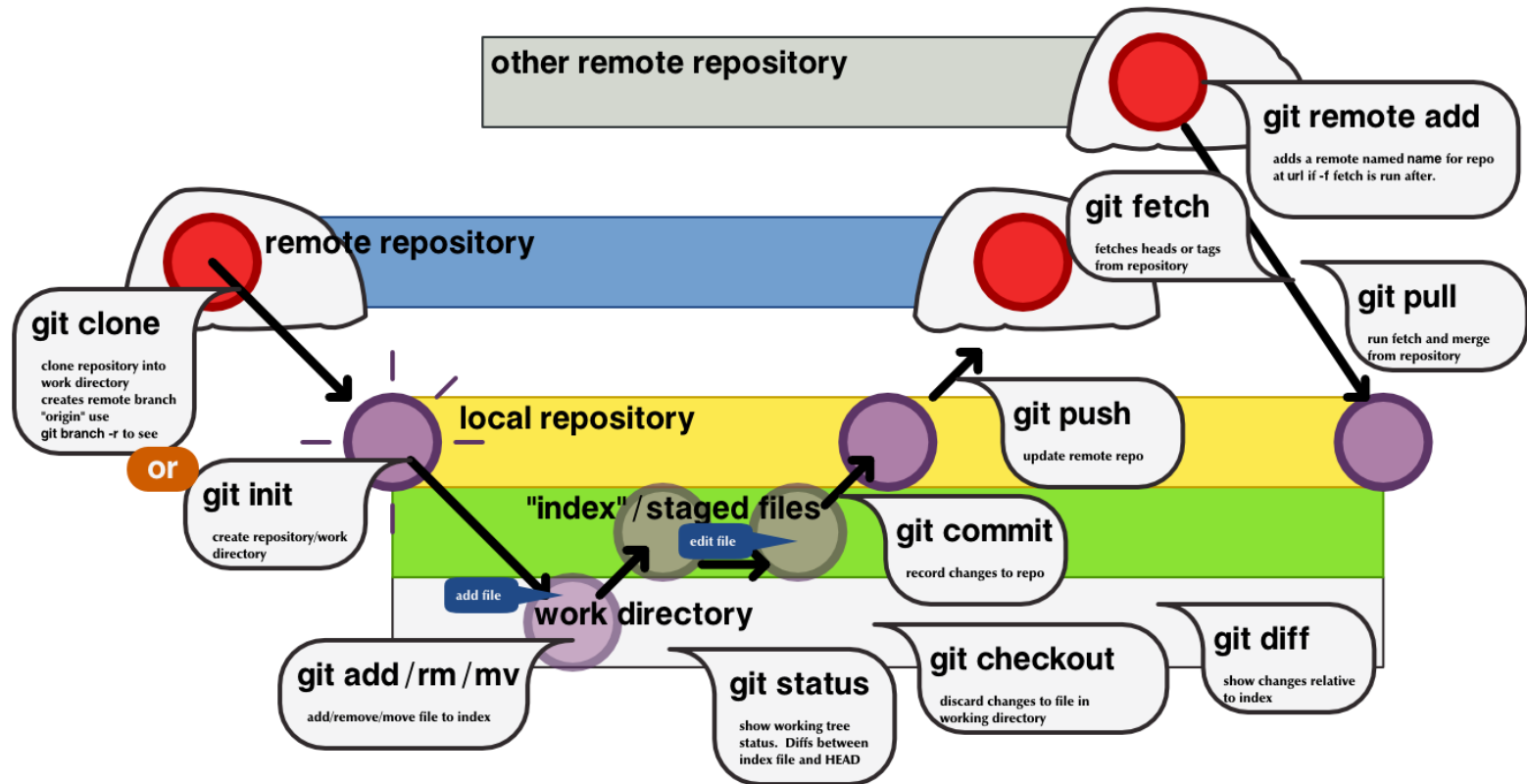
Git Workflow Cycle



Git Hub Demo

github
SOCIAL CODING





GIT Visual cheat sheet

