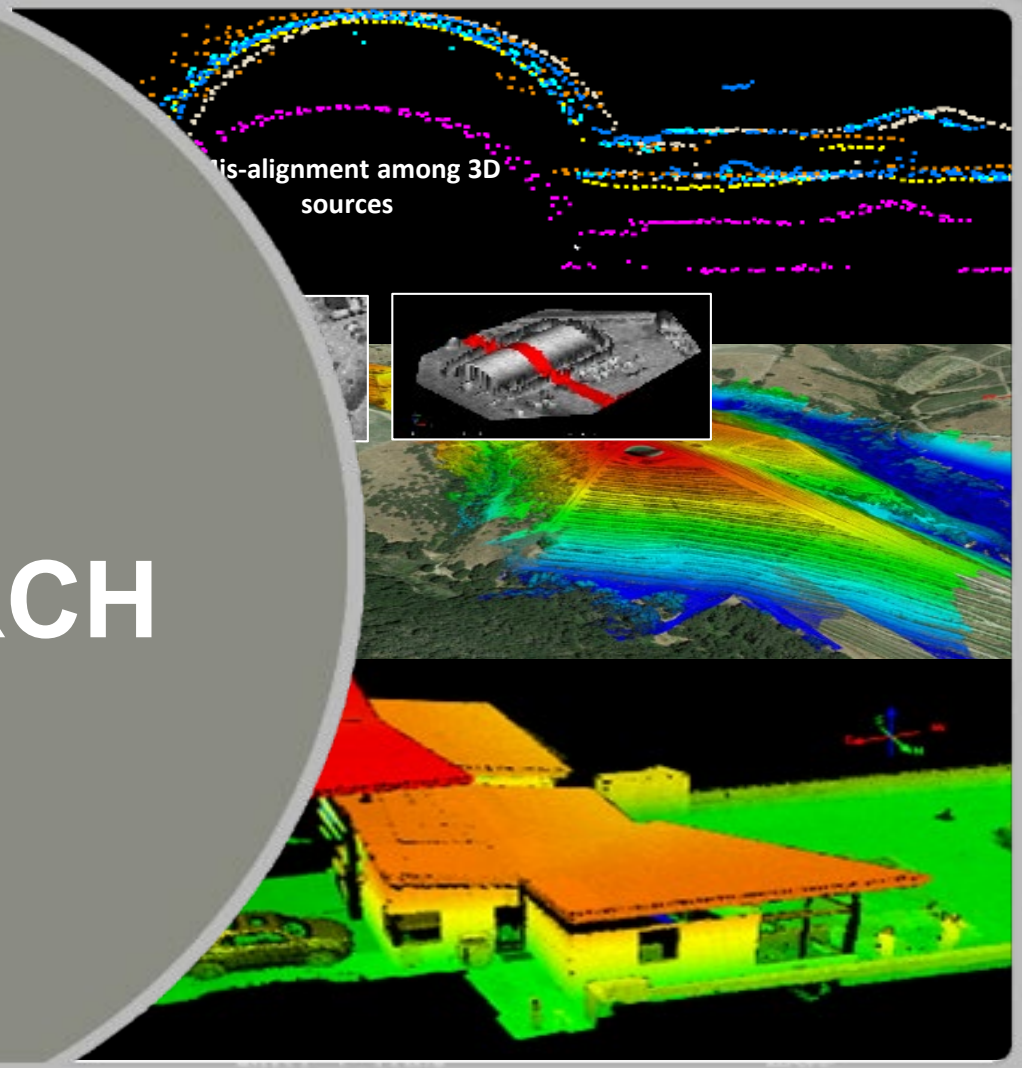
ADAPTING AGILE PHILOSOPHIES AND TOOLS FOR A RESEARCH ENVIRONMENT



Nicole Wayant

nicole.m.wayant@erdc.dren.mil

US Army Corps of Engineers

ERDC
Engineer Research and Development Center

Agenda

- Why science projects need to be managed
- Agile Philosophy
- Agile Tools
- Agile in a Research Environment
- Summary/Discussion

Common Forms of Science Management

- Rigid Sequential Steps/Increments (Waterfall)
  - Clear objective
  - Known plan
  - Process has to restart if work needs to be tweaked or a problem is identified
- Continuous Research
  - Broad research question with no clear milestones
  - Allows for flexibility and a thorough understanding of the problem being explored
  - Scope creep
  - Difficult to track progress
- Problems that plague research also cause issues for software development
  - This is overcome using Agile

Agile Project Management

- Agile was created for software development
- Developed in 2001 by 17 software developers. Together they published the software manifesto
- Agile is NOT a methodology
- Agile is a set of values and principles
- Agile is a common foundation for how a team can make decisions about how to develop software

Agile Values

- Individuals and interactions
- Working software
- Customer collaboration
- Responding to change

- Processes and tools
- Comprehensive documentation
- Contract negotiations
- Following a plan

Left Side > Right Side

12 Principles of Agile

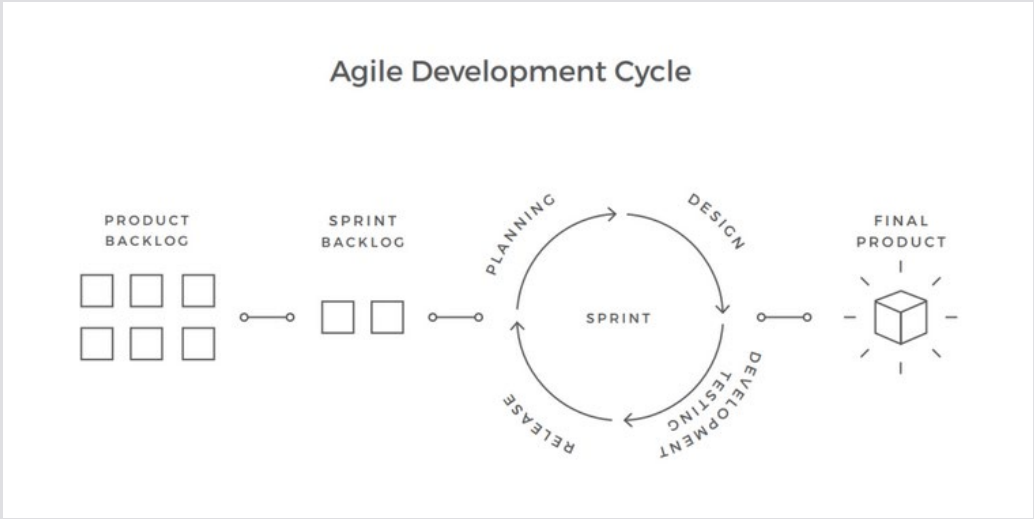
- Satisfy the customer through early and continuous delivery of valuable software
- Welcome changing requirements, even late in development
- Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale
- Business people and developers must work together daily throughout the project
- Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done
- Face-to-face conversations are the most efficient and effective method to convey information within a development team

12 Principles of Agile Continued…

- Working software is the primary measure of progress
- Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.
- Continuous attention to technical excellence and good design enhances agility.
- Simplicity – the art of maximizing the amount of work not done – essential.
- The best architectures, requirements, and designs emerge from self-organizing teams.
- At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly.

Agile Tools Practices

- **Daily Stand-Up/Daily Scrum**
- Planning Poker
- **Scrum events (sprint planning, sprint review, and retrospective)**
- **Kanban**
- Story-driven modeling
- User story

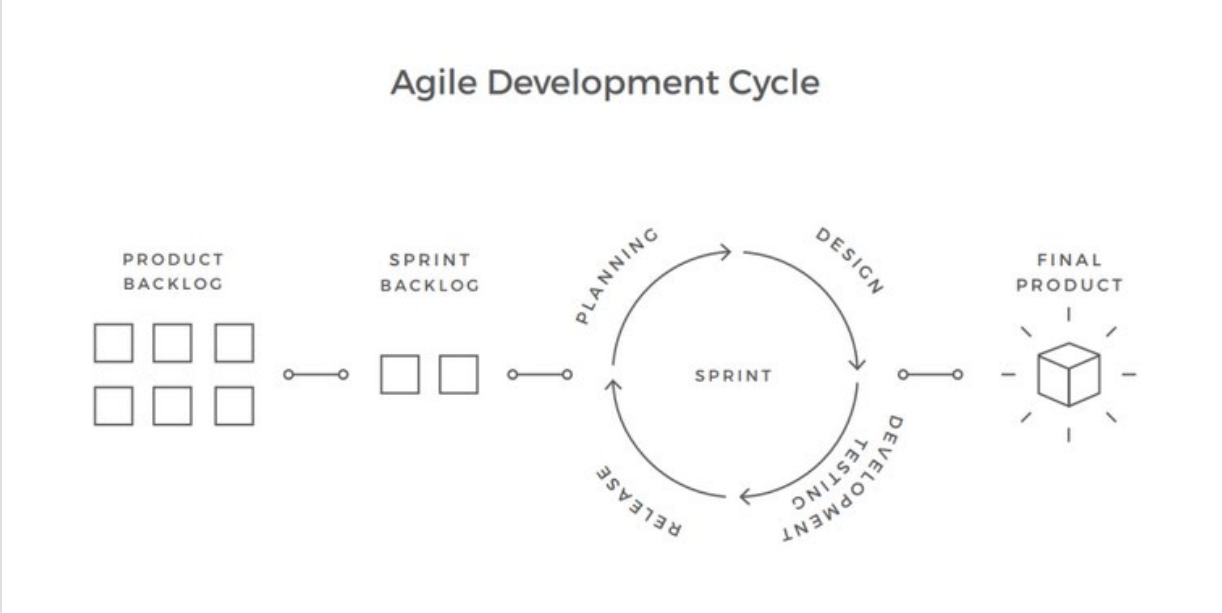


Daily Stand-Up/Daily Scrum

1. No sitting
2. Set agenda
    1. What did you accomplish yesterday?
    2. What do you plan to do today?
    3. What challenges are you facing?
    4. Personal backlog?
3. Short (15 minutes or less)
4. Bring up challenges, not solutions
5. Everyone speaks
6. Designated note taker
7. People follow up on their own

Sprint Planning

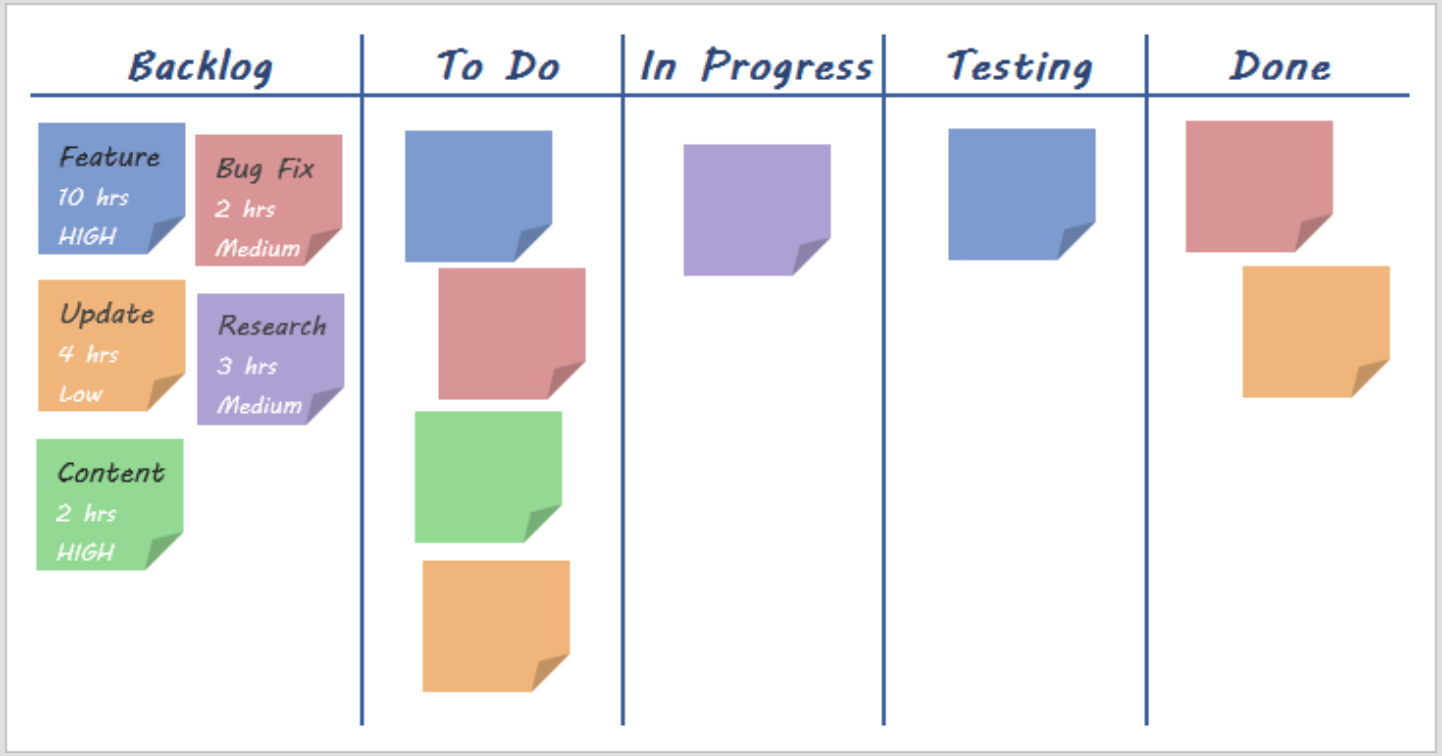
- Sprint Roles
  - Scrum Master
  - Product Owner
  - Development Team
- Sprint Cycle
  - Sprint Planning
  - Daily Scrum
  - Sprint Review



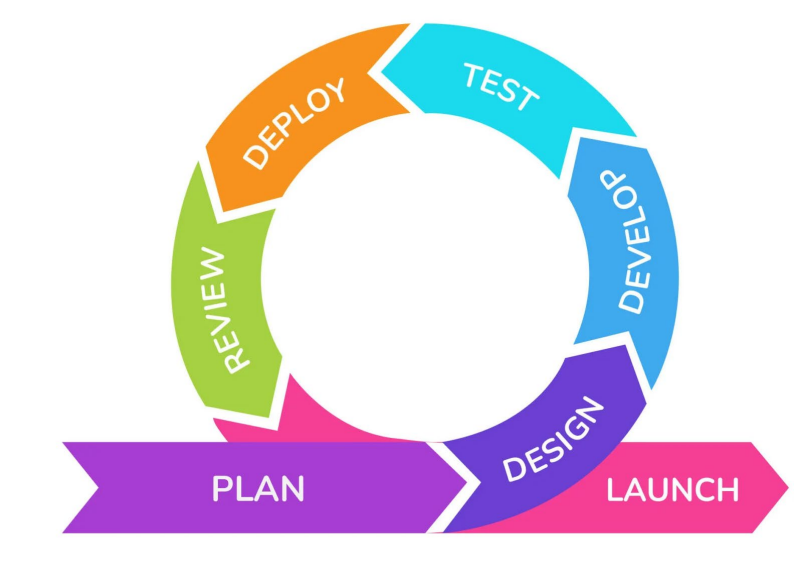
Sprint Planning Continued: Story Points

- Story Points – The Amount of time (or points) needed to complete a task
- All team members, with different skill levels, discuss the tasks and come to single conclusion on the amount of effort needed to complete the tasks
- Within a sprint, no task should have more than 8 story points assigned to it
- Story Points are assigned on the Fibonacci Sequence
  - 1, 2, 3, 5, 8, 13, 21, etc.

Kanban Board



Agile in a Research Environment



Agile Values for Research

- Individuals and interactions
- Working software
  - **Answered question/tested hypothesis**
  - **Working prototype**
  - **Working tool**
- Customer collaboration
  - **Cohort Collaboration**
- Responding to change

- Processes and tools
- Comprehensive documentation
  - **Detailed notes**
  - **User guides**
  - **Journal articles**
- Contract negotiations
  - **Obtaining additional funding**
  - **Funding negotiation**
- Following a plan

Left Side > Right Side

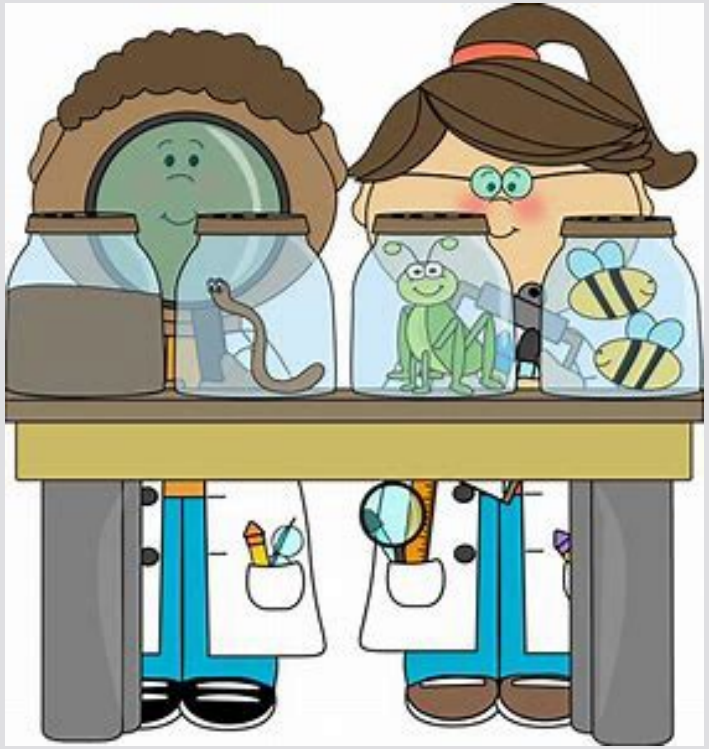
12 Principles of Agile for Research

- Satisfy the customer through early and continuous delivery of valuable software
  - **Satisfy the funding party**
- Welcome changing requirements, even late in development
- Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale
  - **Deliver research progress every couple of months**
- Business people and developers must work together daily throughout the project
  - **Keep management and funding party apprised of work**
- Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done
- Face-to-face conversations are the most efficient and effective method to convey information within a development team

12 Principles of Agile for Research Continued…

- Working software is the primary measure of progress
  - **Answered research questions/tested hypotheses are the primary measure of progress**
- Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.
- Continuous attention to technical excellence and good design enhances agility.
- Simplicity – the art of maximizing the amount of work not done – essential.
  - **Do not make the research project more complicated than it has to be.**
- The best architectures, requirements, and designs emerge from self-organizing teams.
- At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly.

Agile Tools Adapted for Research

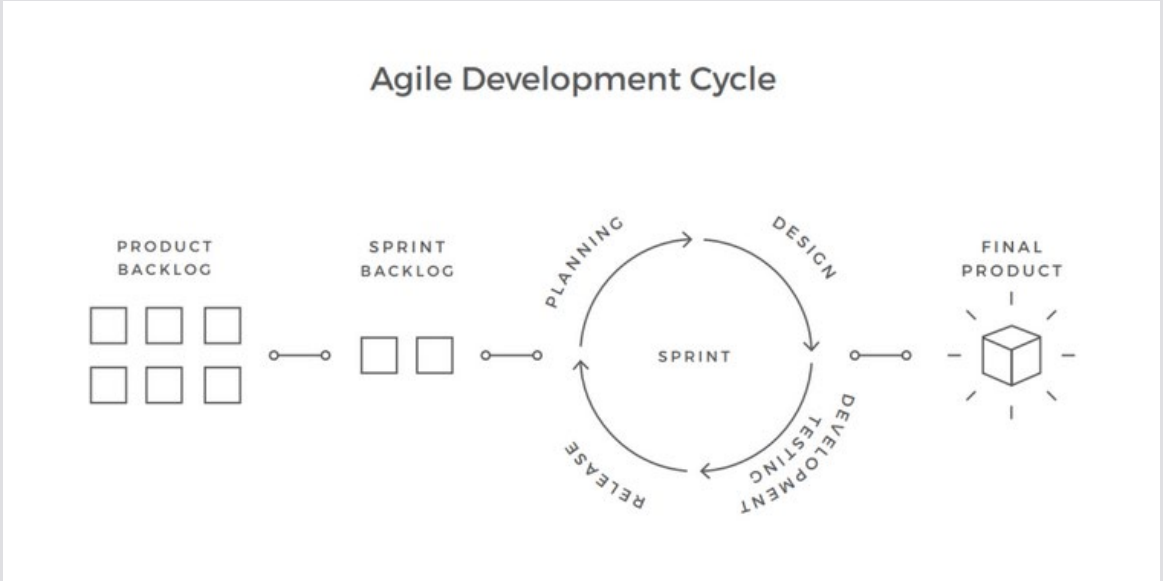


~~Daily Stand-Up/Scrum~~ Weekly Scrum

1. No sitting**/E-mail/Virtual Stand-Up**
2. Set agenda
    1. What did you accomplish ~~yesterday~~ **last week**?
    2. What do you plan to do ~~today~~ **this week**?
    3. What challenges are you facing?
    4. Personal backlog?
3. Short (15 minutes or less **OR 5 minutes to write**)
4. Bring up challenges, not solutions
5. Everyone speaks**/writes an update**
6. Designated note taker **(only if doing a stand-up)**
7. People follow up on their own

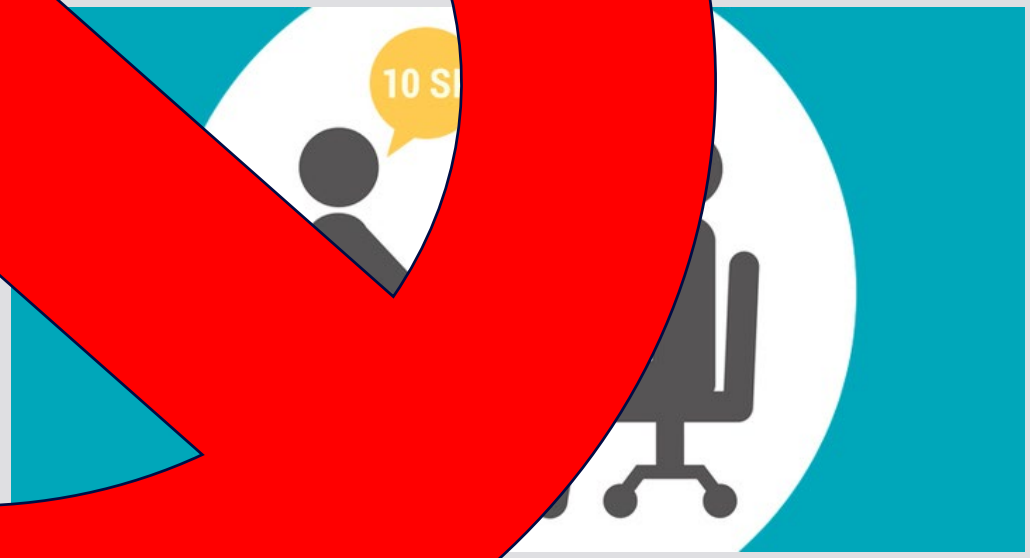
Sprint Planning

- Sprint Roles
  - Scrum Master: PI/PM
  - Product Owner: Work Unit Lead
  - Development Team
- Sprint Cycle
  - Sprint Planning
    - **Once a Month**
  - ~~Daily~~ **Weekly** Scrum
  - Sprint Review
    - **Once a Month, with end of sprint demoes/discussion of results**
  - **Quarterly Milestone Review**

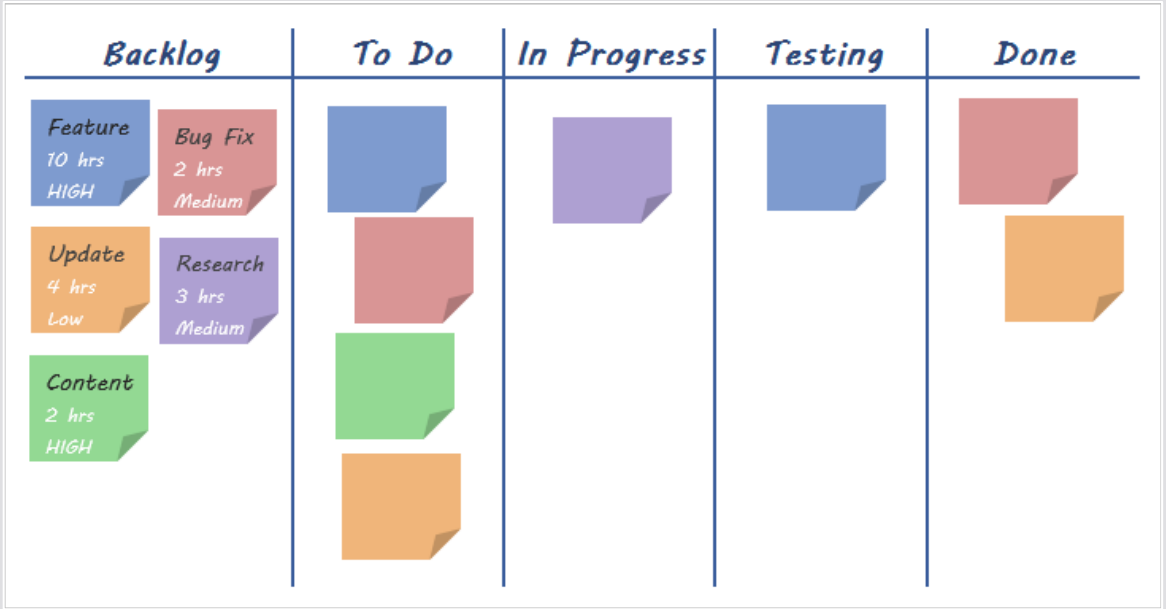


Sprint Planning

- Story Po (or points)
- All tea s, with d levels, e tasks an single on the amou effort r omplete the tas
- Within task should have more th oints assigned to it
  - **16 St Month**
- Story Poin d on the Fibonacci S
  - 1, 2, 3, 5, 8,



Kanban Boards



Answer 2 questions:

- What is being delivered?
- What is the metric of success?

Quarterly Goals	Monthly Goals	Notes
2nd Quarter: Review methodology, distribute 2D imagery over a calibrated test site to groups that can generate the 3D/2.5D data (NGA, OWT)	January: 1. Steven's presentation on the 21st- help gel what we've learned so far 2. Discuss/draw conclusions from qualitative comparison (should have s2p, ENVI, P3D, and buckeye- optional: OpenMVG, if available: Vricon) a. Make categories for pros/cons and see how various methods stack up (quality, list of artifacts, performance on stereo and non-stereo, time/data requirements) b. Start more thorough parameter study for non-NGA methods (start in Jan, may take longer) 3. Start quantitative comparison using code Ryan/Chris used/re-wrote recently (get code) 4. Start thinking about how to design data collect	Things completed as planned: • Steven presented qualitative conclusions regarding HALOE, Buckeye, P3D, Vricon (low res), ENVI default settings, s2p default settings • Started chart of attributes of methods listed above • Ran ENVI method with different parameter values • Started looking into evaluation code • Met to discuss goals and broad strokes of data collect Unforeseen changes: • Getting s2p running proved more difficult than expected but results ended up being fairly promising with some caveats as it's finicky
	February: 1. Finish more thorough parameter study for non-NGA methods if necessary. [Deliverable: documentation of performance (qualitative at first, quantitative-as far as we get) on Mosul AOIs, including images and insights. Also, share las files on shared drive or rdedrive.] More specifically: a. Try s2p with different parameters b. See if combinations of promise ENVI parameters help c. Try evaluation metrics on a. and b. (next goal) 2. {Updated at Feb sprint meeting to continue into March} Continue quantitative comparison using developed previous code. [Deliverable: code and results on P3D, HALOE, ENVI, S2P, and Buckeye.] This will likely involve: a. Make kmls of surfaces of interest b. Set up work flow to read in files, perform tests we are interested in (gsd, voids, horizontal RSME, vertical RSME). c. Maybe distribute the actual running of b. between multiple people. 3. Continue data collect design 4. Obtain pre-existing relevant data of AP Hill area. [Deliverable: las files on shared drive or rdedrive] a. Request Vricon b. Request P3D c. Buckeye/other point clouds from GRID d. Get DG stereo (and perhaps non-stereo images) e. If time allows, run s2p and ENVI methods (determine which parameter settings to use), otherwise March 5. Deeper Dive presentation: Charlotte	Things completed as planned: • Ran s2p on a wide variety of parameters and performed preliminary parameter analysis • Ran ENVI on variety of parameters, applied metrics, and documented results in deeper dive • Rewrote robust z-precision code • Discussed logistical and technical aspects of quantitative analysis across multiple methods (sharing points clouds, selecting areas for z-precision and h-rmse) • Received Vricon point clouds of Mosul and AP Hill • Buckeye AP Hill data is on shared drive • Downloaded DG stereo images Adjustments: • Run final s2p parameter analysis in early March • Look into ArcGIS 2D-to-3D method in March
	March: 1. Finish parameter study of s2p [Deliverable: summary of results on Teams, best point clouds on shared drive] 2. Make any final alterations to evaluation metrics code [Deliverable: keep code on shared drive relatively up-to-	Things completed: • Finished parameter study for s2p- (\\data01.erdc.dren.mil\GRL-Shared\BDA\S2P_Mosul) • Created workflow for quantitative analysis and shared preliminary results in Deeper Dive

Summary

- Adopting the philosophies of Agile has helped to keep my projects both flexible and on target
- Weekly Scrum
  - Transparency across the teams
  - Allows PI to stay up to date on technical progress
  - Helps PI identify problem areas
- Monthly Sprint Planning and Demos
  - Transparency across the teams
  - Demonstration and discussion of technical progress
- Kanban Board
  - Everyone knows what is expected of them
  - 2 Questions: 1) What is the deliverable? 2) Metrics of Success?
- Embrace the Agile philosophies (AKA, Learn To Let Go)
  - Let the teams determine how they want to organize, do scrums, and complete their Kanban boards
  - Easy to see progress of team as a whole
  - Value people over projects

Questions and Discussion