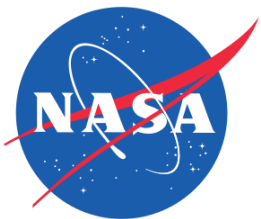


NASA Western Water Applications Office (WWAO)

Accelerating the application of NASA observations and scientific analysis techniques to tangible, important, and timely water management problems

water.applications@nasa.gov



Jet Propulsion Laboratory, California Institute of Technology.



Goals of visit

- Introduce the NASA Western Water Applications Office (WWAO)
- Meet with potential project leads / team members and discuss opportunities to participate in WWAO
- Get feedback / comments on process and project concept form

NASA Western Water Application Office (WWAO) Experiment

What is the WWAO?

A new initiative from NASA's Earth Science Division, Applied Sciences Program to support Western US water management to put NASA data to work in making decisions.

What Does the WWAO Do?

- Connect stakeholders with NASA scientists, technology, tools, and data.
- Develop custom solutions through applications projects.
- Assist application transition into operational state.

Why the NASA-WWAO?

- Apply NASA's wealth of science, remote sensing data and expertise.
- Leverage decades of investment in science and technology.
- Develop and maintain lasting relationships with stakeholders.

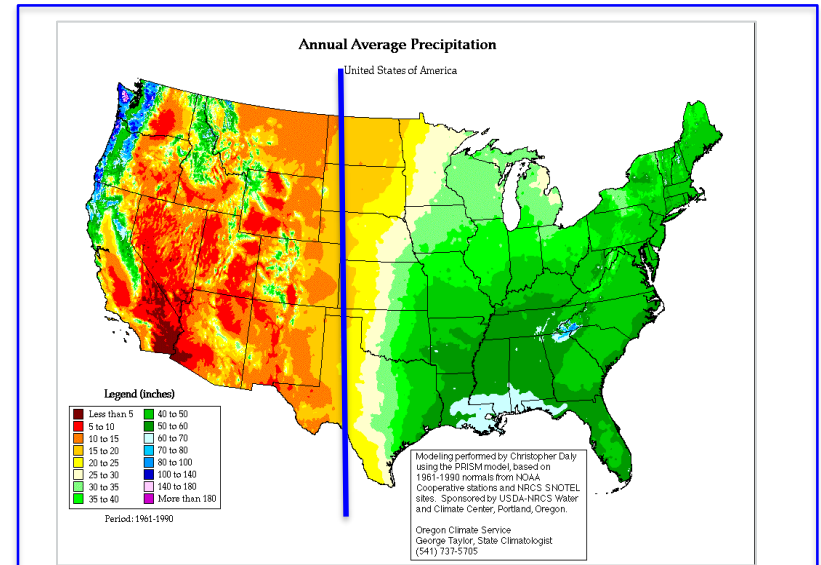


Figure 1 - A 30-year climatology of annual U. S. Precipitation. The red line denotes the 100th meridian. (Source: C. Daly, Oregon State University)

The Western United States is defined by the Department of Interior (DoI) as those states that are on or west of the 100th meridian and encompasses the states represented by the Western Governor's Association (WGA). It is roughly the divide between the "wet" east and the "dry" west

NASA Western Water Application Office (WWAO) Experiment

What is the WWAO?

A new initiative from NASA's Earth Science Division, Applied Sciences Program to support Western US water management to put NASA data to work in making decisions.

What Does the WWAO Do?

- Connect state water scientists, tribal water scientists, and federal water scientists.
- Develop custom water applications projects.
- Assist application transition into operational state.

Why the NASA-WWAO?

- Apply NASA's wealth of science, remote sensing data and expertise.
- Leverage decades of investment in science and technology.
- Develop and maintain lasting relationships with stakeholders.

Acknowledge and leverage the work of other agencies and stakeholders working in this arena and see where NASA data / expertise can help!

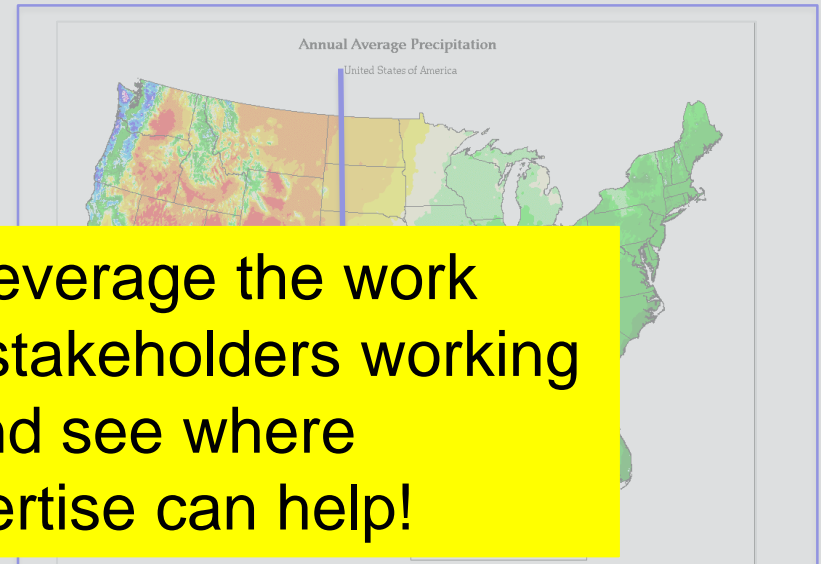


Figure 1 - A 30-year climatology of annual U. S. Precipitation. The red line denotes the 100th meridian. (Source: C. Daly, Oregon State University)

The Western United States is defined by the Department of Interior (DoI) as those states that are on or west of the 100th meridian and encompasses the states represented by the Western Governor's Association (WGA). It is roughly the divide between the "wet" east and the "dry" west

NASA Western Water Application Office (WWAO) Experiment

What is the WWAO?

A new initiative from NASA's Earth Science Division, Applied Sciences Program to support Western US water management to put NASA data to work in making decisions

What Does the

- Connect state scientists, the
- Develop current applications projects.
- Assist application transition into operational

Why the NASA

- Apply NASA's wealth of science, remote sensing data and expertise.
- Leverage decades of investment in science and technology.
- Develop and maintain lasting relationships with stakeholders.

Acknowledge and leverage the work of other agencies and stakeholders working in this arena and see where NASA data / expertise can help!

Likewise, leverage work / expertise across NASA centers to participate

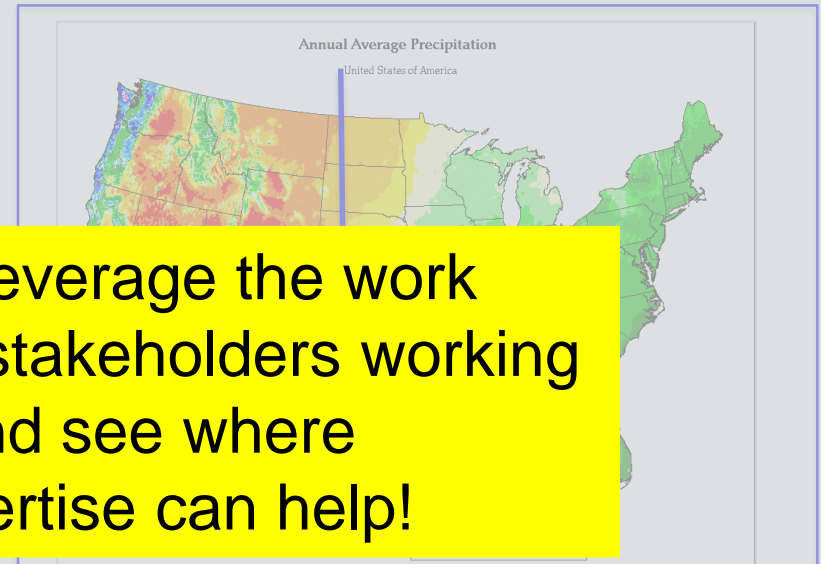
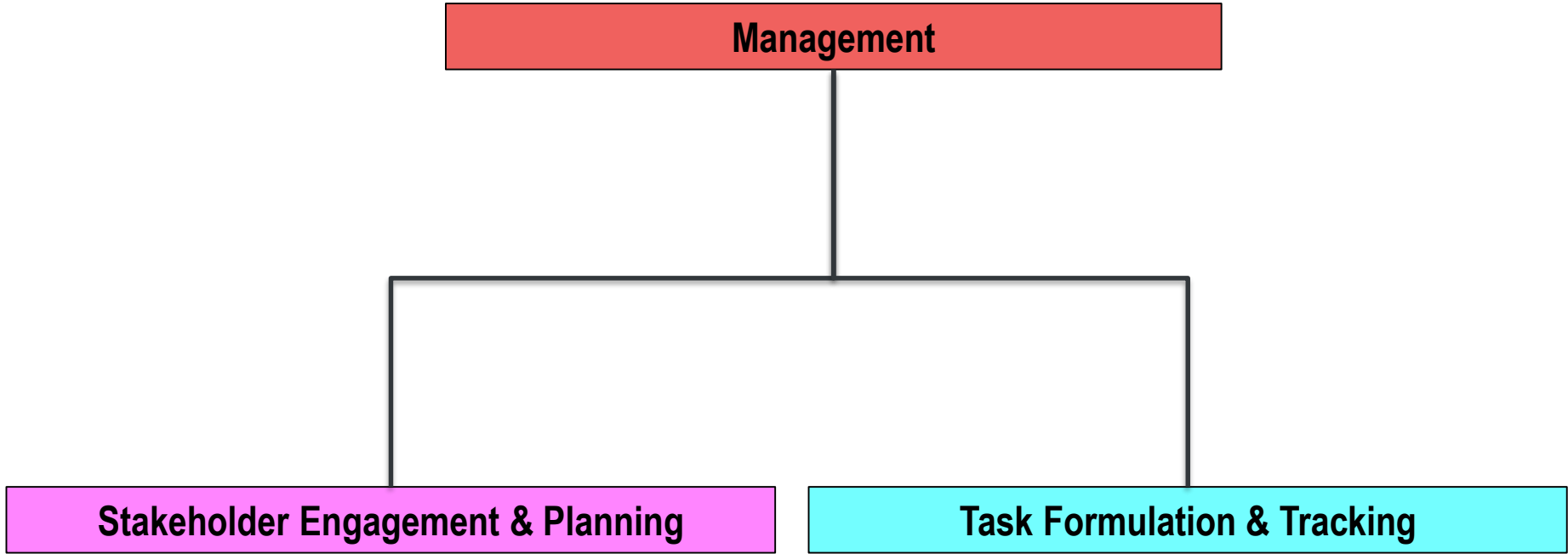


Figure 1 - A 30-year climatology of annual U. S. Precipitation. The red line denotes the 100th meridian. (Source: C. Daly, Oregon State

...ed by the ...se states that are on or west of the 100th meridian and encompasses the states represented by the Western Governor's Association (WGA). It is roughly the divide between the "wet" east and the "dry" west

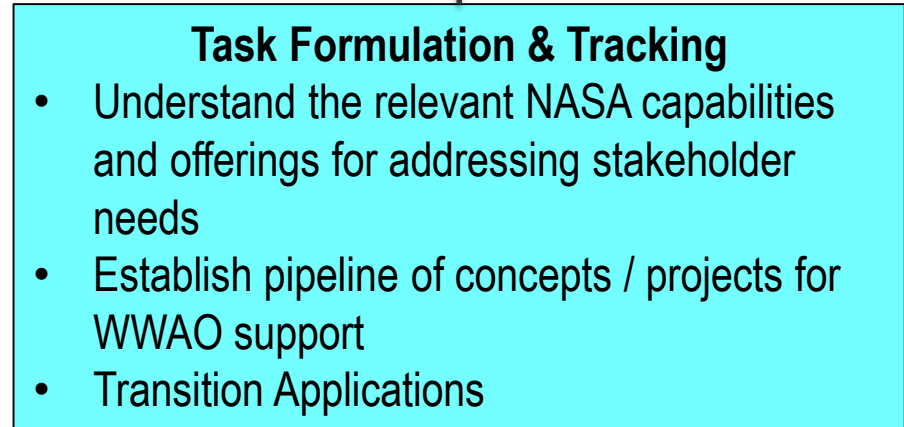
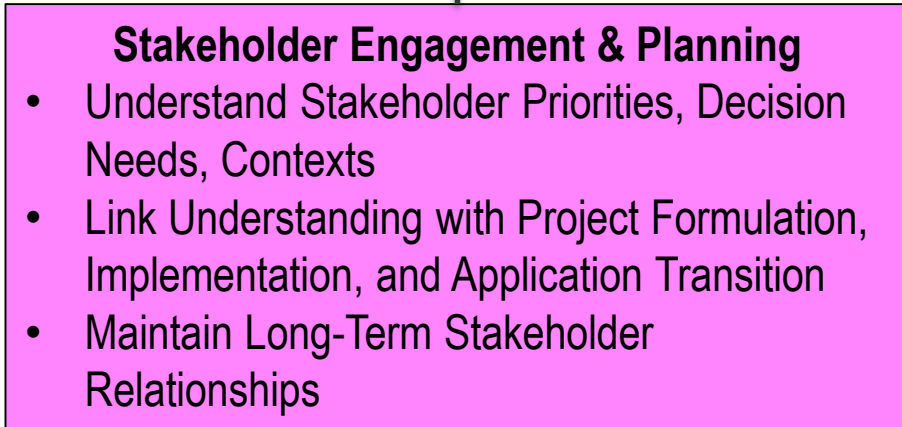
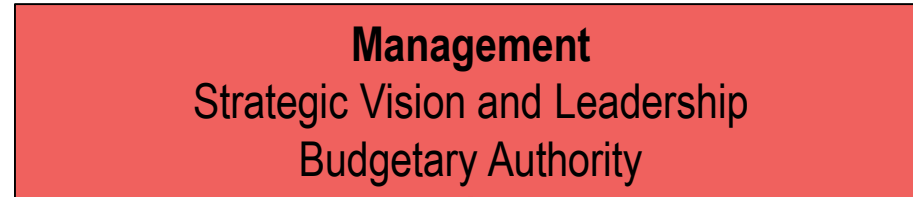
WWAO – NASA's Western Water Applications Office

A local western office helping to inform water decisions with NASA data



WWAO – NASA’s Western Water Applications Office

A local western office helping to inform water decisions with NASA data



WWAO – NASA's Western Water Applications Office

A local western office helping to inform water decisions with NASA data

Management

Program Manager (Act.), Dr. Randy Friedl (JPL)

Chief Applied Scientist, Dr. Jay Famiglietti (JPL)

ARC Leadership

Dr. Christa Peters-Lidard (GSFC)

Strategic Comm, Dr. Amber Jenkins (JPL)

Cynthia Johnson (Finance)

Stakeholder Engagement & Planning

SE&P Lead, Stephanie Granger (JPL)

SE&P Tactical, Judy Lai-Norling (JPL)

SE Working Group

Forrest Melton (ARC), Dr. Danielle Wood (GSFC), Dr. Maggie Hurwitz (GSFC)

Task Formulation & Tracking

Program Applied Scientist, Dr. Christine Lee (JPL)

Program System Engineer, Dr. Charles Budney (JPL)

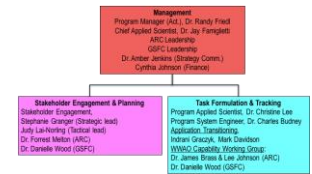
Application Transitioning

Indrani Graczyk (JPL), Mark Davidson (JPL)

Capability Working Group:

Dr. James Brass (ARC), Lee Johnson (ARC), Dr. Christa Peters-Lidard (GSFC), Dr. John Bolten (GSFC)

Stakeholder Engagement and Planning

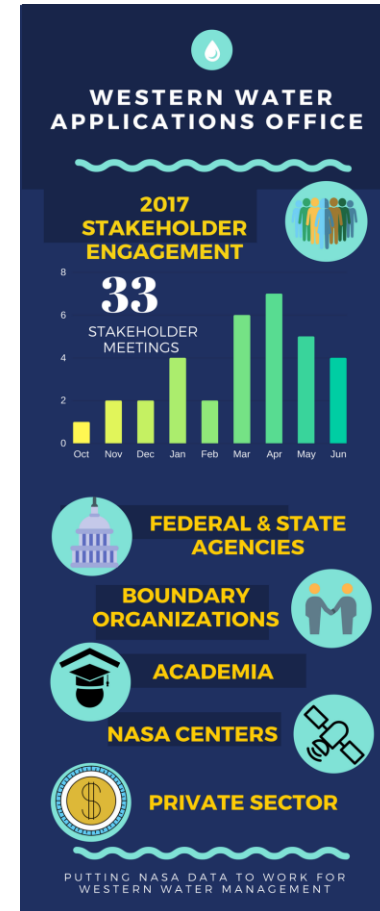


Goals

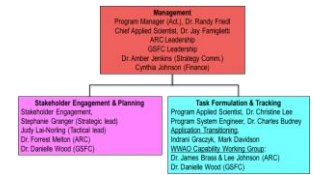
- Understanding Stakeholder Priorities, Decision Needs, Contexts
- Link Understanding with Project Formulation, Implementation, and Application Transition
- Maintaining Long-Term Stakeholder Relationships

Activities

- Report: Needs Assessment Report (Summarize Stakeholder Needs, Priorities)
- Market Surveys (Review and Focus on Subset of Stakeholders)
- Establish and maintain partnerships
- Review of Concepts and Formulation Deliverables for Stakeholder Connections and Needs
- Manage the Stakeholder Engagement Working Group



Task Formulation



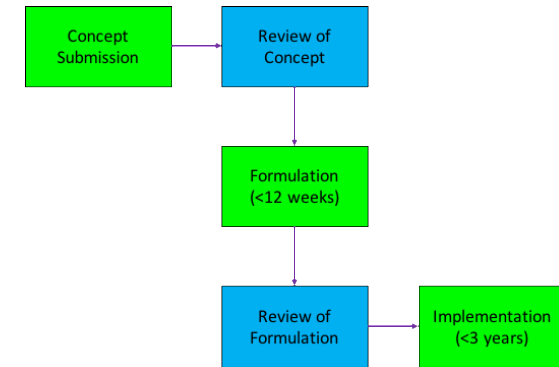
Goals

- Understand relevant NASA capabilities and offerings for addressing stakeholder needs
- Establish pipeline of concepts / projects for WWAO support
- Ensure scientific integrity of project deliverables
- Transition Applications

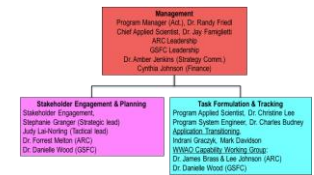
Activities

- Manages (and Revises / Improves) Pipeline and Review of New Concepts
- Manages Project Formulation and Engagement with Proposing Project Teams
- Manages “Gate Reviews” For Funded Projects
- Monitors and Supports Project Progress

Task Selection Process and Project Life Cycle



Sub-element of Task Formulation: Applications Transition



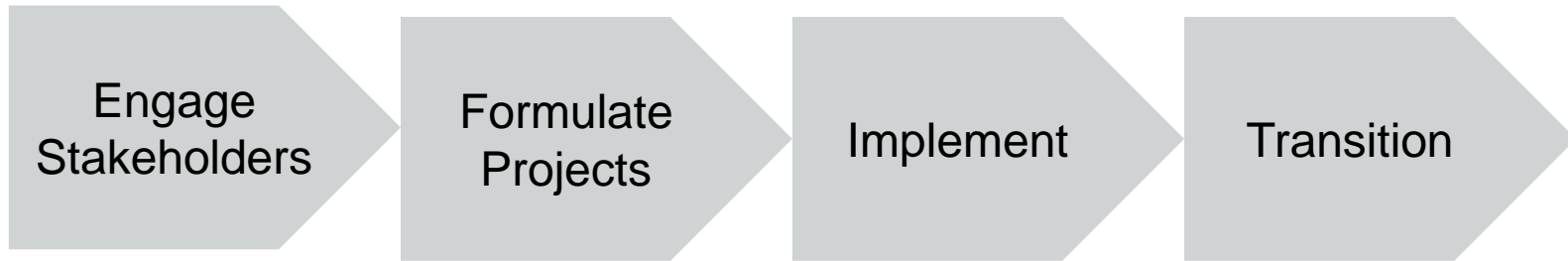
Goal

- Facilitate Transition of Applications to Sustainable Operation Outside of NASA

Activities

- Conduct Business Case Studies
- Develop Financial, Transition Plans
- Define Offering / Customer Requirements
- Recruit Implementation Organization
- Facilitate Tech Transfer Agreements





Maintain long term relationships

Understand western water user priorities / needs

Match Capability to Need.
Develop project requirements / deliverables based on needs; require stakeholder engagement / commitment

Projects led by a task manager focused on delivery of products (instead of research / publications)

Assist projects with long term planning (how does the application exist post WWAO funds/period of performance)

Project Life Cycle

Stakeholder Engagement

Engage
Stakeholders

Formulate
Projects

Implement

Transition

Maintain long
term
relationships

Understand
western water
user priorities /
needs

Match Capability
to Need.
Develop project
requirements /
deliverables based
on needs; require
stakeholder
engagement /
commitment

Projects led by
a task manager
focused on
delivery of
products
(instead of
research /
publications)

Assist projects
with long term
planning (how
does the
application exist
post WWAO
funds/period of
performance)

Project Life Cycle

Transition

Stakeholder Engagement

Engage Stakeholders

Formulate Projects

Implement

Transition

Maintain long term relationships

Understand western water user priorities / needs

Match Capability to Need.
Develop project requirements / deliverables based on needs; require stakeholder engagement / commitment

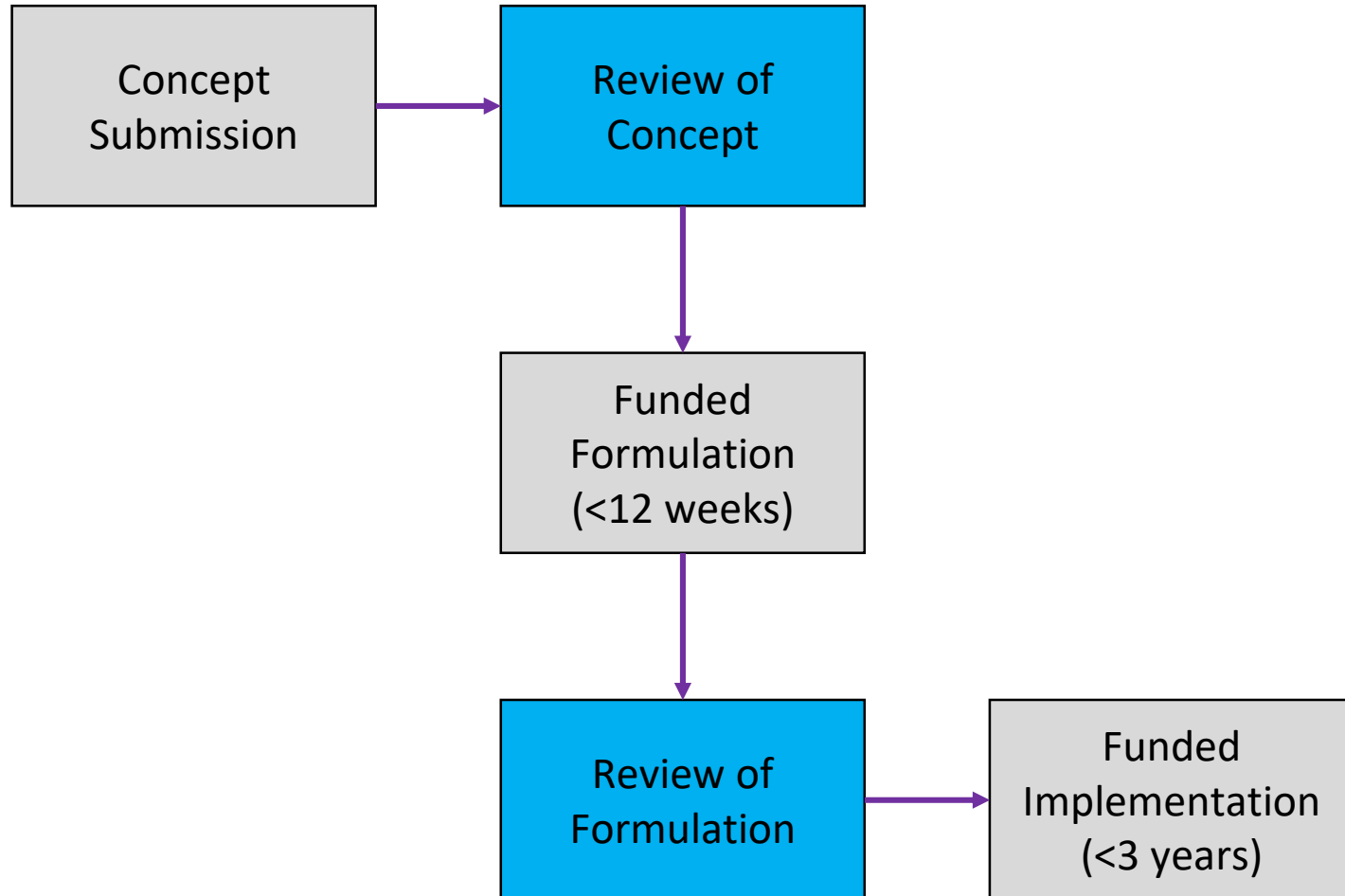
Projects led by a task manager focused on delivery of products (instead of research / publications)

Assist projects with long term planning (how does the application exist post WWAO funds/period of performance)

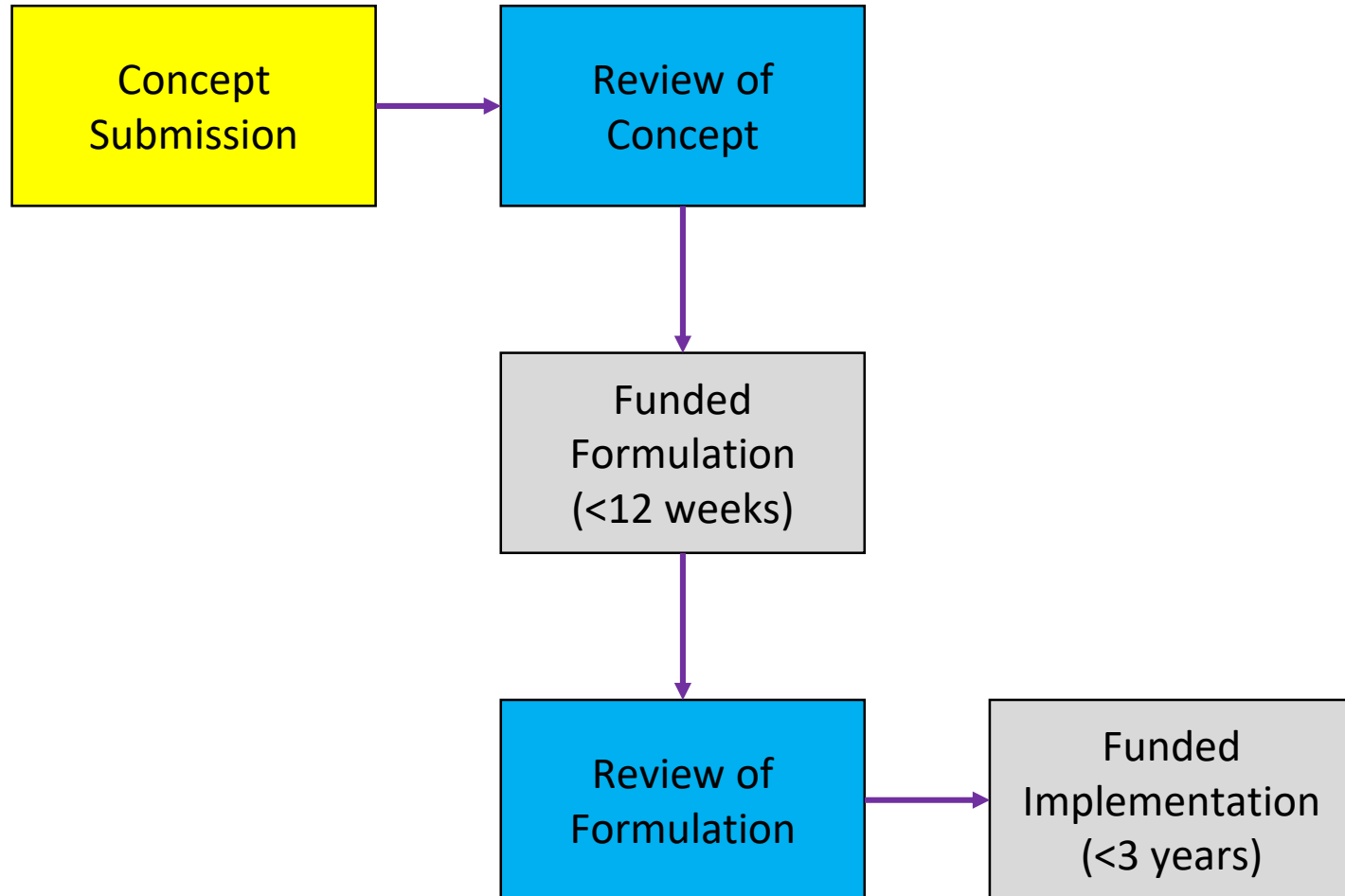
Monitoring / Assessment / Feedback / Improve Process

Project Life Cycle

WWAO Task Selection Process



WWAO Task Selection Process



Submitting a Concept

Capabilities Quad Chart

Concept Development and Submission

Save time by doing some initial legwork

Items required in initial submission

- Review Needs Assessment Report
- Become Aware of A Stakeholder Need
- Contact WWAO to Discuss

- Concept Quad Chart
- Concept Form / Template

Or submit a quad chart summary of your current capability, and if we come a potential project (match your capability to a need), we will contact you

Short Title of Project

Project POC (First Name, Last Name, Affiliation, Email)

Project Goals / Desired Impact or Benefit

- Overall goals of project
- ..
- ..

- Motivation of project
- Geographic Extent / Coverage
- Desired impact within timeframe of project

End Users / Decision-Makers

Please note if project partners are in development

- *Where are they based? What is their purview?*
- *How are they using the information? (Or, how will they use it?)*
- *What are their information requirements?*

Description of Capability Being Used/Developed

- What (NASA) data is being utilized?
- How mature is the capability?
- How it will be used?
- What tasks are there (sensor is end of life, etc)?

Exemplary Figure / Graphical Abstract

Concept Quad Chart Template

Phase 1 - Concept Generation	
<p>Welcome to the WWAO Task Concept Form: This is a communication tool to help develop task concepts that might be developed with WWAO support.</p> <p>How to Start: Fill out Sections A, B, and C as best you can. Submit to Christine.M.Lee@jpl.nasa.gov and Charles.J.Budney@jpl.nasa.gov.</p>	
Concept Title:	
Section A: Contact information for person submitting out this form.	
A1. Name:	A2. Title:
A3. Email:	A4. Phone:
A5. Describe state of partnership between stakeholder and project lead	
<input type="checkbox"/> Looking for stakeholder <input type="checkbox"/> Stakeholder identified <input type="checkbox"/> Existing/on-going partnership <input type="checkbox"/> not yet contacted <input type="checkbox"/> preliminary contact made	
Section B: Understanding landscape of water decision maker needs & project stakeholder.	
B1. Who is the decision maker?	
B1a. Name:	B1b. Title:
B1c. Email:	B1d. Phone:
B2. Short description of decision maker role:	
B3. What is the decision?	
B4. How is the decision currently made with respect to data?	
B4A. What datasets does the decision-maker currently access? How often? What geographic extent?	
B4B. How are these data utilized?	
Section C: Application Project/Task Concept	
This section represents the concept for addressing the decision maker's need.	
C1. What application would you be providing?	
C1A. Describe draft or baseline requirements for the products to be delivered through the application.	

C1B. How does the project anticipate the products be delivered (format, frequency, medium)?
C2. How does the proposed application improve effectiveness or efficiency of target decision-making process? <i>Example: Stakeholder partner uses 3 gauges to look at streamflow across XX,XXX sq miles and gets updates monthly. Proposed application will effectively allow for X greater coverage, with daily or weekly updates.</i>
C3. What is the impact of improving the decision? <i>This could be in terms of a rough-order-of-magnitude estimate of volume of water saved, economic benefit, environmental benefit, etc.</i>
<input type="checkbox"/> Near term <2 years <input type="checkbox"/> Longer term > 2 years
C4. How does the application support partners' time to participate / collaborate?
<input type="checkbox"/> Real-time <input type="checkbox"/> Other (please describe)
C5. How long will the project be ready to start transfer to operational status? <i>Include a rough order of magnitude timeline from the current state of work to be ready to start working with WWAO support to operational status (which is the phase WWAO might support). Include current version of product/asset and potential technical risks to success.</i>
C6. Which Operational Agency would the application be transferred to, and are you in contact with them? If so, please name the contact.
C7. Technical Proof of Concept. Please provide references that help reinforce the case that this project can successfully meet baseline requirements. Can include papers (peer reviewed or otherwise), reports, posters, case studies.
C8. Estimated budget (rough order of magnitude per year)
C9. Types of Project Elements Included in Budget (check all that apply)
<input type="checkbox"/> Applications Development <input type="checkbox"/> Application Prototyping / Integration into decision-making process <input type="checkbox"/> Capacity Building and Training <input type="checkbox"/> Application Transition to Operations

Concept Form

Review Criteria

Concepts will be evaluated for the following:

- Alignment with WWAO Mission
- Stakeholder Involvement / Engagement
- Impact Level
- Technical / Cost Feasibility

Review Criteria

WWAO Task Rating Criteria

Adjective Rating	Numerical Rating	Criteria Definition	1. Aligns with the WWAO mission of "getting NASA data to Western Decision Makers?"		2. Stakeholder involvement		3. Potential Impact level*	4. Technical Feasibility under proposed budget.	
Superior	4	Exhibits a very high level of expertise, merit or knowledge. Highly acceptable, thoroughly comprehensive; leaves very little else to be desired.	Information product directly usable by decision maker.	Data from a long-term series of NASA missions with commitment to provide data (e.g., sea surface altimetry).	Stakeholder who can influence Western Decision Maker decisions over the entire western region.	Stakeholder commits to using delivered products in decisions. And significant monetary or FTE commitment (>1FTE).	Save water volume of 500,000 acre feet per year.	Certain success under proposed budget.	Team has successfully lead Application to DM use.
Very Good	3	Exhibits a high level of expertise, merit or knowledge. More than acceptable, comprehensive; generally, does not require improvement, or additional information and clarification.	Information product can be delivered into an identified existing pipeline to provide product usable by decision maker. Commitment to infuse exists.	Data from NASA mission with multiyear lifetime and potential to become a long term measurement (for example, SMAP).	Stakeholder who can influence Western Decision Maker decisions over a state or major city.	Stakeholder commits to trial use of delivered products in operational decisions. And/or financial commitment in the 0.25 to 1 FTE.	Save water volume of 50,000 acre feet per year.	High likelihood of success under the proposed budget.	Manager or development team has experience leading Application to DM use.
Acceptable	2	Exhibits an acceptable level of expertise, merit or knowledge. Room for improvement.	Information product can be delivered into an identified existing pipeline to provide product usable by decision maker. No commitment to infuse.	Data comes from operation of a short-term orbital mission (SMEX) or airborne platform with potential to become long term data products from NASA orbital mission.	Stakeholder who can influence Western Decision Maker decisions over a city or major water district.	Stakeholder commits to testing use of delivered products in decisions. And/or financial commitment in the 0.05 to 0.25 FTE.	Save water volume of 5,000 acre feet per year.	Moderate likelihood of success under the proposed budget.	Team has worked together successfully in the past and qualified to do the work.
Poor	1	Exhibits a low level of expertise, merit or knowledge. Requires considerable improvement, but has correction potential.	Path from delivered product to useable decision maker product likely exists, but not identified.	Data from other NASA sources, such as models not based on NASA data.	Stakeholder who can influence Western Decision Maker decisions over a town or small water district.	Expression of support without financial commitment.	Save water volume of 500 acre feet per year.	Some likelihood of success under the proposed budget.	New Team qualified to do the work.
Unacceptable	0	Exhibits a serious lack of knowledge, merit or expertise. Weaknesses not fixable. Data not suitable for evaluation or not furnished.	Product likely not useable by decision maker.	Data not from an area under NASA charter (example, setting up stream gauges).	Not influencing a Western Decision Maker	No support.	Does not show evidence of significant water savings.	Not likely to be feasible under the proposed budget.	Manager or team not qualified to do the task.

*Use water volume first; number of people and costs are attempts to provide direction where water volumes are not available. Use 6 persons per acre foot or \$1000 per acre foot as equivalents for now. Or equivalent value to special groups (e.g., reservations, endangered species, disaster mitigation); this is a judgement call for now.

Review Criteria

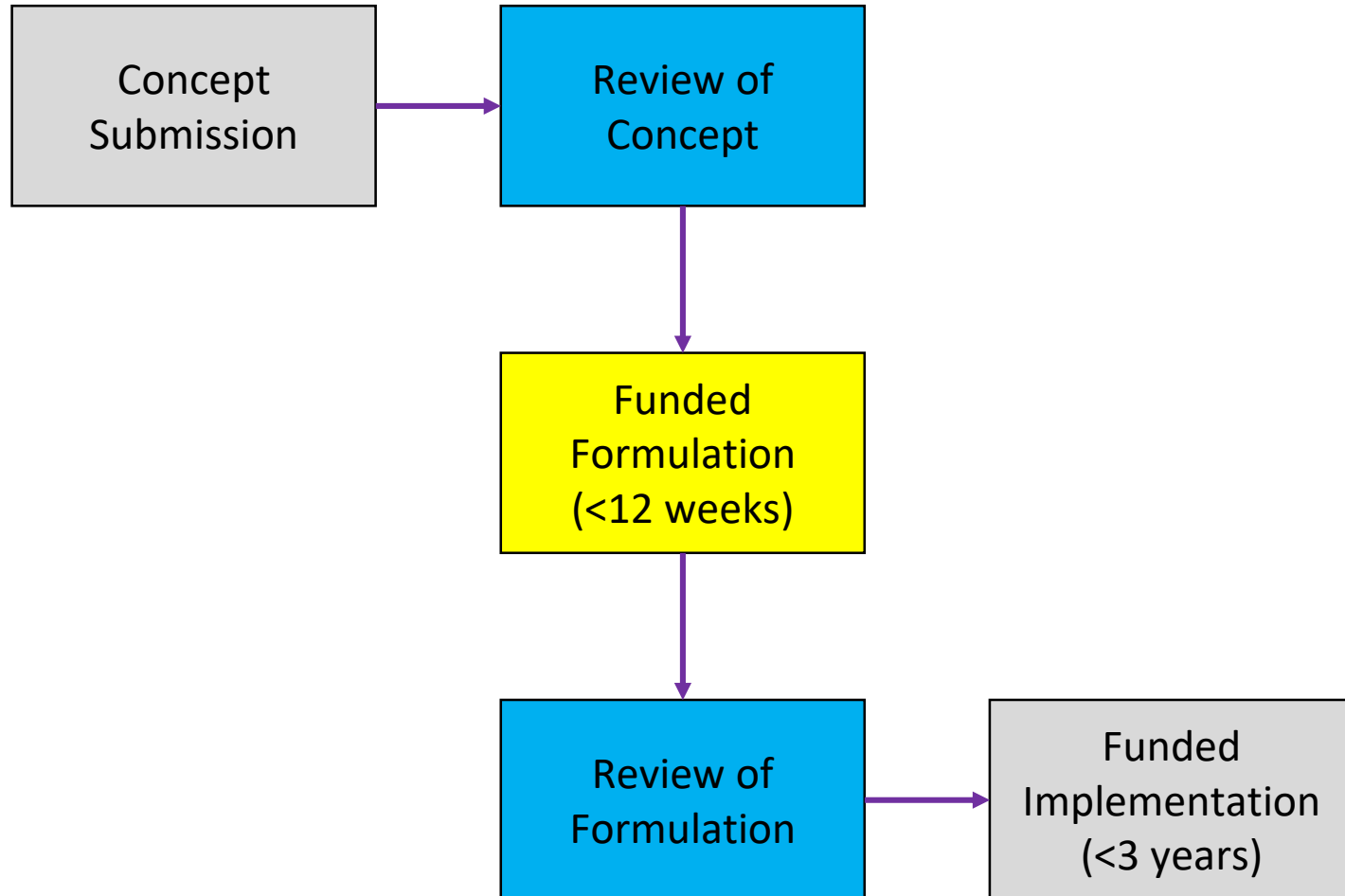
WWAO Task Rating Criteria

Adjective Rating	Numerical Rating	Criteria Definition	1. Aligns with the WWAO mission of "getting NASA data to Western Decision Makers?"		2. Stakeholder involvement		3. Potential Impact level*	4. Technical Feasibility under proposed budget.	
Superior	4	Exhibits a very high level of expertise, merit or knowledge. Highly acceptable, thoroughly comprehensive; leaves very little else to be desired.	Information product directly usable by decision maker.	Data from a long-term series of NASA missions with commitment to provide data (e.g., sea surface altimetry).	Stakeholder who can influence Western Decision Maker decisions over the entire western region.	Stakeholder commits to using delivered products in decisions. And significant monetary or FTE commitment (>1FTE).	Save water volume of 500,000 acre feet per year.	Certain success under proposed budget.	Team has successfully lead Application to DM use.
Very Good	3	Exhibits a high level of expertise, merit or knowledge. More than acceptable, comprehensive; generally, does not require improvement, or additional information and clarification.	Information product can be delivered into an identified existing pipeline to provide product usable by decision maker. Commitment to improve existing product.	Data from NASA mission with multiyear lifetime and potential to become a long term measure.	Stakeholder who can influence Western Decision Maker decisions over a town or small water district.	Stakeholder commits to using delivered products in decisions. And significant monetary or FTE commitment (0.5 to 0.25 FTE).	Save water volume of 500,000 acre feet per year.	Some likelihood of success under the proposed budget.	Manager or development team has experience leading Application to DM use.
Acceptable	2	Exhibits a moderate level of expertise, merit or knowledge. Acceptable, but may require improvement, or additional information and clarification.	Information product exists, but not identified.	Data from other NASA sources, such as models not based on NASA data.	Stakeholder who can influence Western Decision Maker decisions over a town or small water district.	Expression of support without financial commitment.	Save water volume of 500 acre feet per year.	Some likelihood of success under the proposed budget.	Team has worked together successfully in the past and qualified to do the work.
Poor	1	Exhibits a low level of expertise, merit or knowledge. Weaknesses not fixable. Data not suitable for evaluation or not furnished.	Information product exists, but not identified.	Data from other NASA sources, such as models not based on NASA data.	Stakeholder who can influence Western Decision Maker decisions over a town or small water district.	Expression of support without financial commitment.	Save water volume of 500 acre feet per year.	Some likelihood of success under the proposed budget.	New Team qualified to do the work.
Unacceptable	0	Exhibits a serious lack of knowledge, merit or expertise. Weaknesses not fixable. Data not suitable for evaluation or not furnished.	Product likely not useable by decision maker.	Data not from an area under NASA charter (example, setting up stream gauges).	Not influencing a Western Decision Maker	No support.	Does not show evidence of significant water savings.	Not likely to be feasible under the proposed budget.	Manager or team not qualified to do the task.

We are a hands on office, we want to help!

*Use water volume first; number of people and costs are attempts to provide direction where water volumes are not available. Use 6 persons per acre foot or \$1000 per acre foot as equivalents for now. Or equivalent value to special groups (e.g., reservations, endangered species, disaster mitigation); this is a judgement call for now.

WWAO Task Selection Process

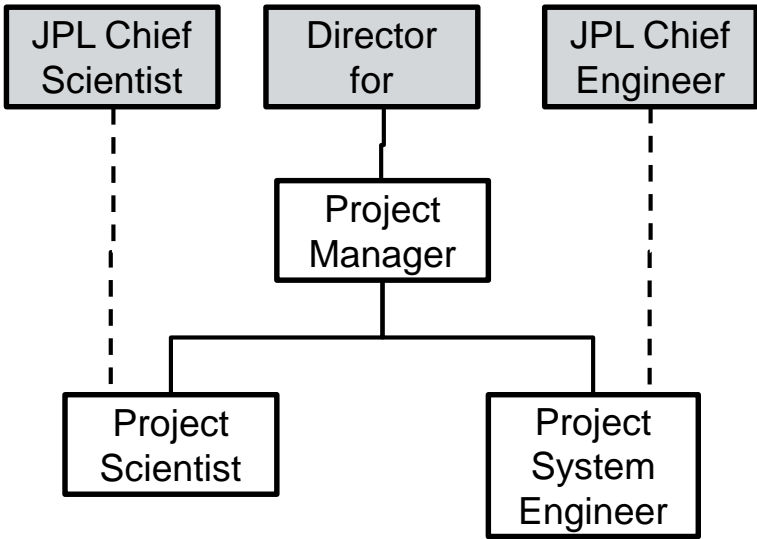


Funded Formulation Phase < 12 week

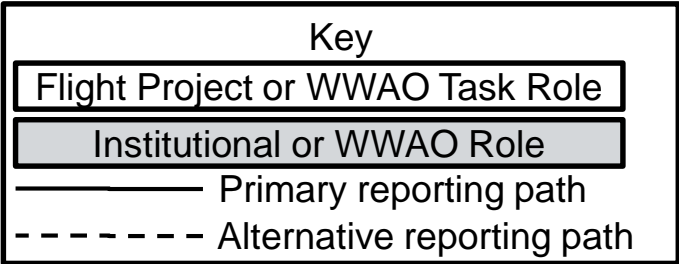
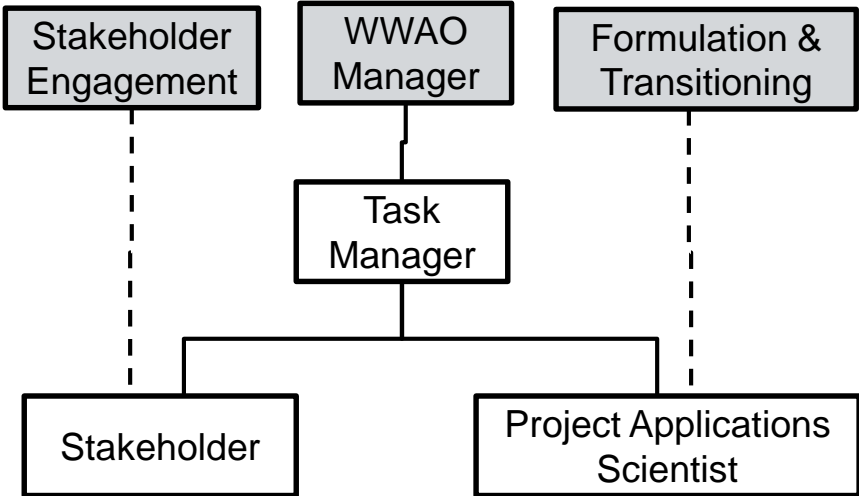
- Development Team prepares Task Work Plan in conjunction with WWAO Team
- Note: The WWAO may suggest innovative methods for developing this plan. The WWAO would support any additional costs associated with these innovative methods.
- Task Work Plan includes:
 - Preliminary Requirements agreed to with the Stakeholder
 - Stakeholder engagement plan
 - Preliminary Design of product generation process
 - Preliminary Product examples
 - Framework for operational product production
 - Schedule with deliverable milestones
 - Detailed cost
 - Preliminary discussion on transition paths
 - Proposed Team Org Chart

Example of a Proposed Team Org Chart

- Flight Project

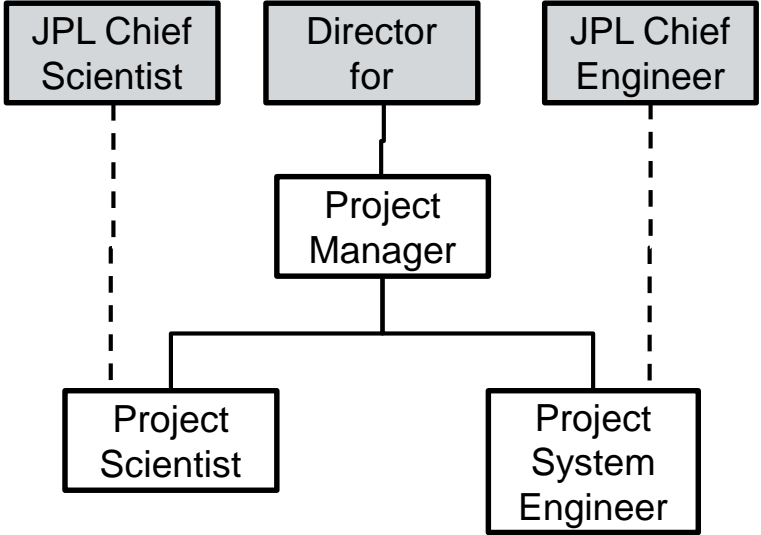


- WWAO Task

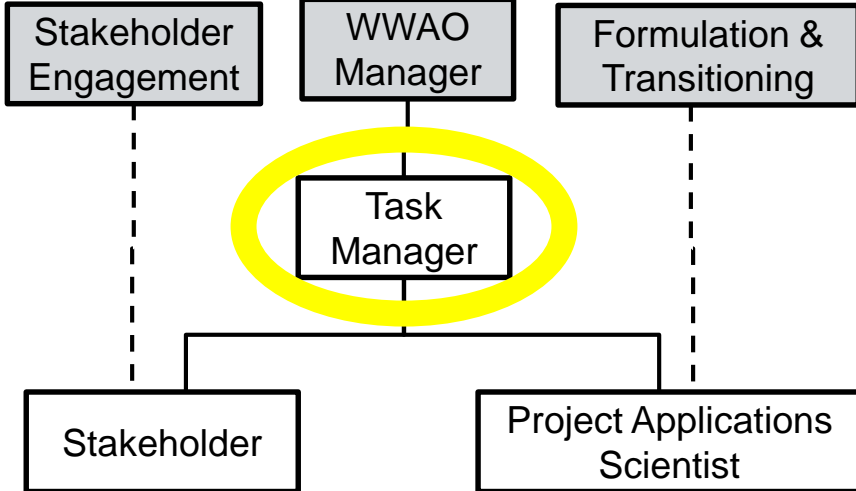


Example of a Proposed Team Org Chart

- Flight Project



- WWAO Task



Key

- Flight Project or WWAO Task Role
- Institutional or WWAO Role
- Primary reporting path
- Alternative reporting path

Frequently Asked Questions

To submit a question, please contact WWAO.

Q Who is eligible for funding from WWAO?

A *NASA Centers, Universities, Partner / Stakeholder Agencies, Private Firms*

Q Who is eligible to **lead** a project?

A *The task manager, at this stage in WWAO, must be based at a NASA Center.*

Q How long does it take between submitting a concept to being notified about selection?

A *Variable, depending on complexity of project. Currently from concept to funded formulation, 2 months. Funded formulation should not exceed 12 weeks, so we are target no more than 14 weeks from beginning of funded formulation to selection.*

Q What if I don't know who my stakeholder / project partner is?

A *Please submit a quad chart of the proposed capability (will provide template). We will contact you if we see an opportunity to match your work to a stakeholder need.*

Q What if I don't know how to "assess impact" or describe expected impact? *Please contact*

A *us so that we can review the concept and discuss how to do this.*

WWAO Project Portfolio

FY16-FY17 Pilot Projects:

Task Lead	Key Stakeholder(s)	Title
Tom Painter (NASA JPL)	California Department of Water Resources, San Francisco Public Utilities Commission	Operational Analysis and Modeling with the Airborne Snow Observatory (ASO)
Forrest Melton (NASA ARC)	California Department of Water Resources	Satellite Mapping of Agricultural Land Following for Drought Impact Assessment and Decision Support
Christa Peters-Lidard (NASA GSFC)	National Water Center and the California State Water Resources Control Board	Supporting the Western States Water Mission with the Land Information System for Enhanced NASA Water Data Distribution and External Stakeholder Engagement
Forrest Melton (NASA ARC); Sara Larsen (WSWC)	Western States Water Council and water resource management agency council members	Understanding the landscape of water decision maker needs & project stakeholders in using cloud computing resources for integrated web data services

FY18 Projects in Formulation:

Task Lead	Key Stakeholder(s)	Title
Alberto Guzman, NASA ARC-CREST	Cooperative Extension of Monterey County (Salinas); end users are ~1000 commercial growers/shippers	Satellite augmentation of CropManage irrigation scheduling
Joshua B. Fisher, NASA JPL	New Mexico Office of the State Engineer	Operational Evapotranspiration for the State of New Mexico
Cindy Schmidt, NASA ARC	Navajo Nation	Navajo Nation Water Resources and Drought Monitoring

Thank you

water.applications@jpl.nasa.gov