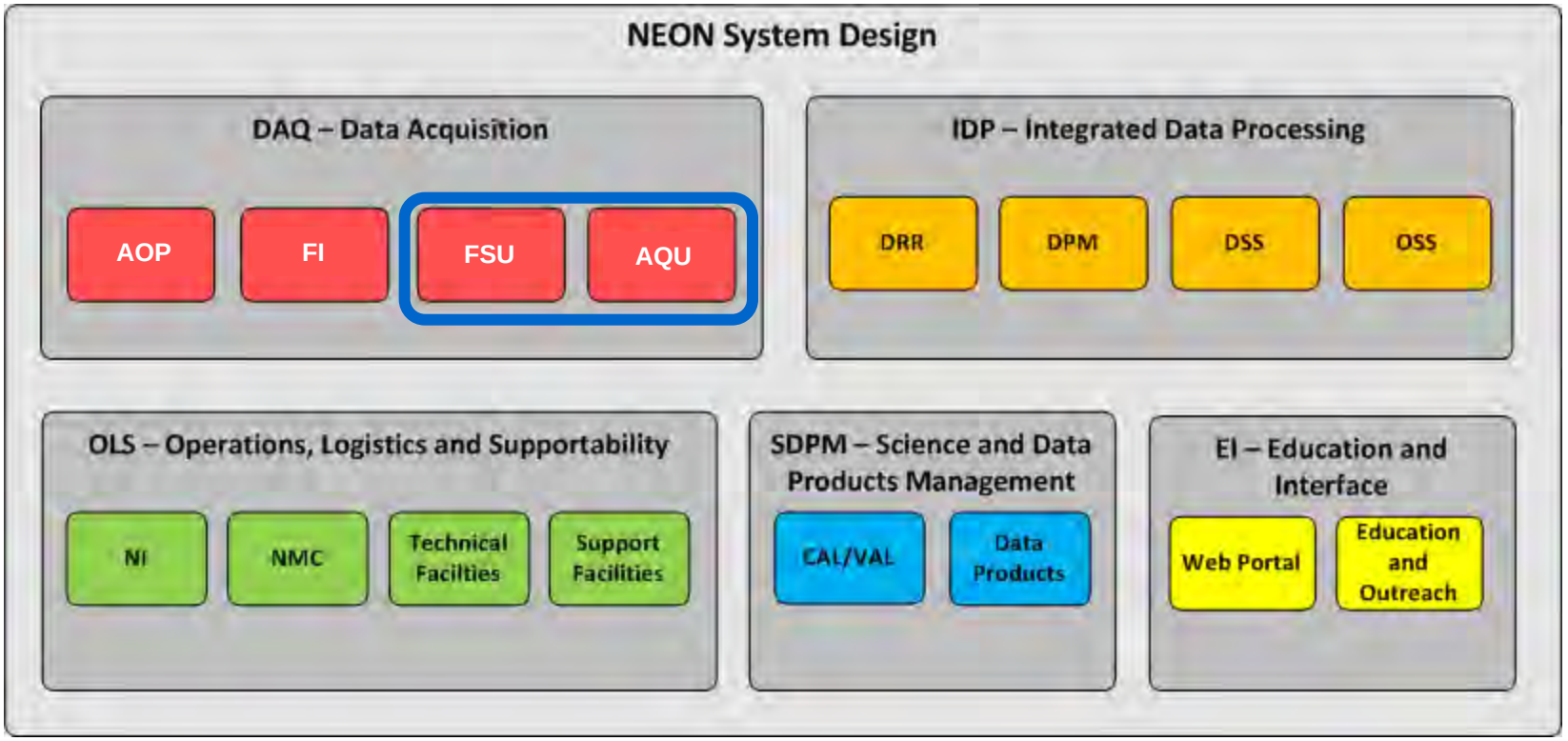
National Ecological Observatory Network

Fundamental Sentinel Unit

B. Kao/H. Powell/P. Martin/ C. Gibson/R. Gallery/K. Blevins

FSU in the NEON System



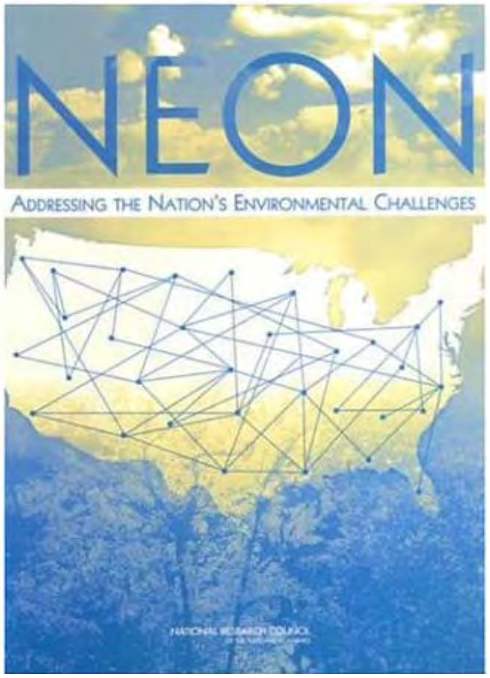
Overview

- Platform to enable science that
  - Addresses ecological processes at the **continental** scale
  - Facilitates extrapolation from **local measurements** to the National observatory (NOD 2008)
- Provide standardized, diverse measurements related to:
  - Invasive Species
  - Biodiversity
  - Biogeochemistry
  - Ecohydrology
  - Infectious Disease
- Not easily measured with fixed instruments
- Quantification of inter-annual trends

Grand Challenges → Measurement Suites

- Biodiversity/Invasive Species
- Biogeochemical Cycles
- Ecohydrology
- Climate Change
- Infectious Disease
- Land Use

National Research Council Press 2001 Washington DC



National Research Council Press 2003 Washington DC

Grand Challenges → Measurement Suites

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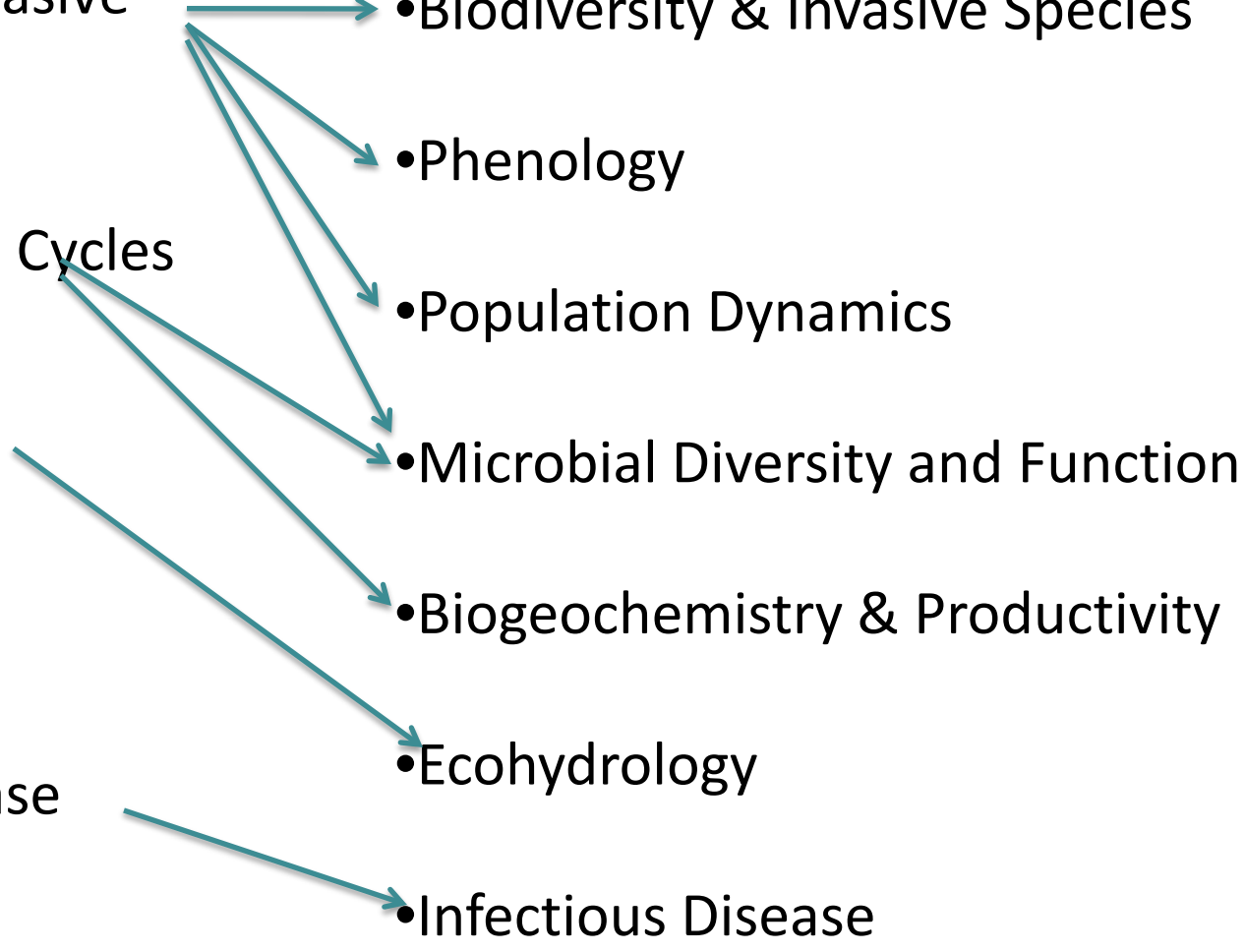


Science Requirements

	Biodiversity & Invasive species	Microbial Diversity & Function	Biogeochemistry & Productivity	Ecohydrology	Infectious Disease	Phenology	Population Dynamics
Plants	X	X	X			X	X
Small Mammals	X		X		X		X
Birds	X						
Ground dwelling beetles	X						X
Mosquitoes	X				X	X	X
Fish	X			X			X
Aquatic Invertebrates	X		X	X			
Algae	X	X	X	X			
Water		X	X	X			
Soil		X	X	X			

Sentinel Organisms

Microbes

Mosquitoes

Aquatic Invertebrates

Beetles

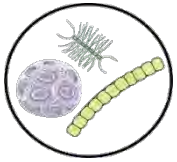
Small Mammals

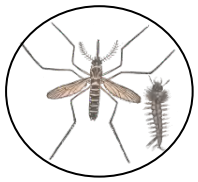
Fish

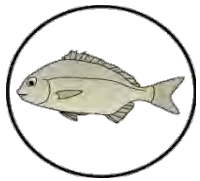
Birds

Plants

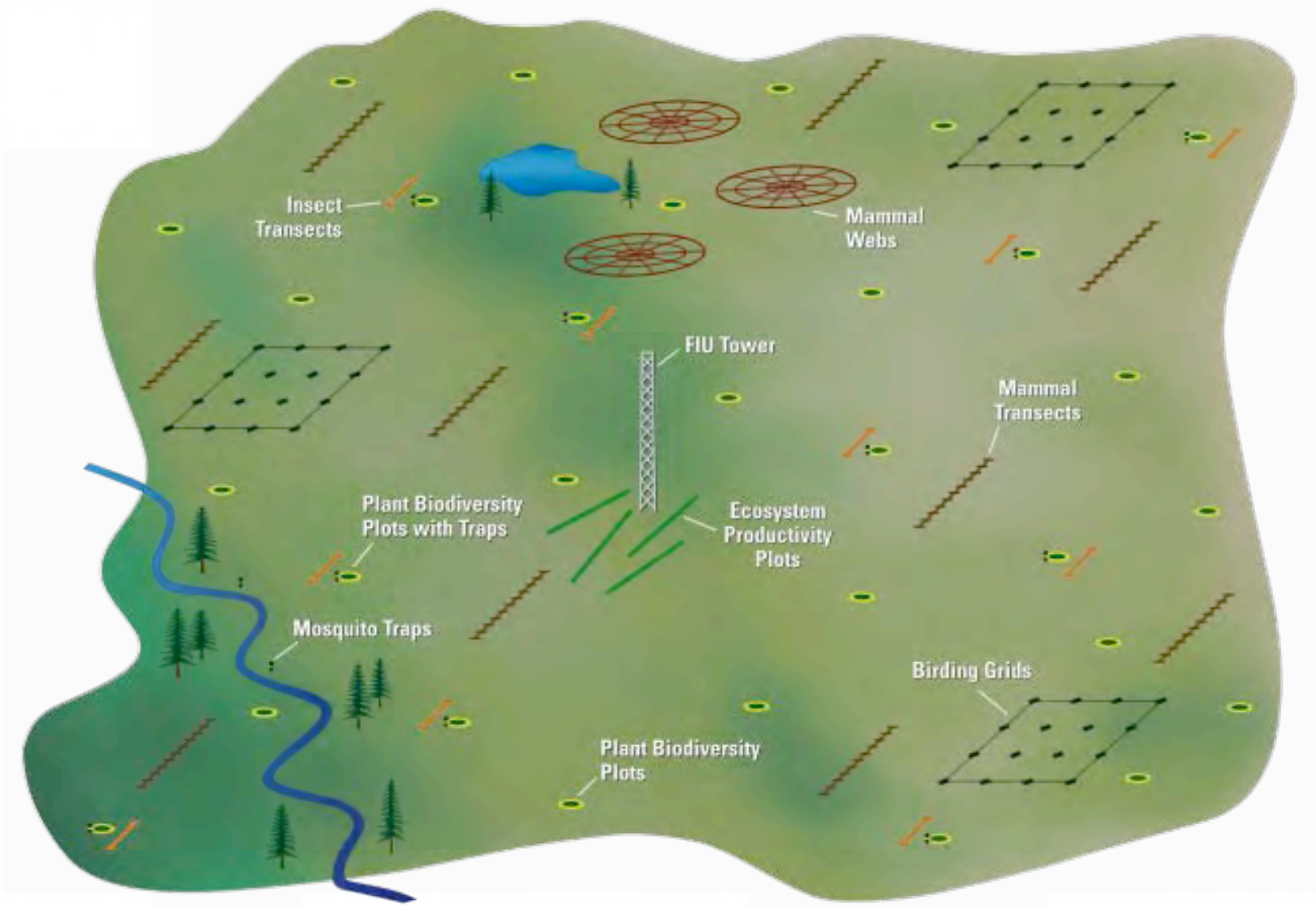
Generation Time



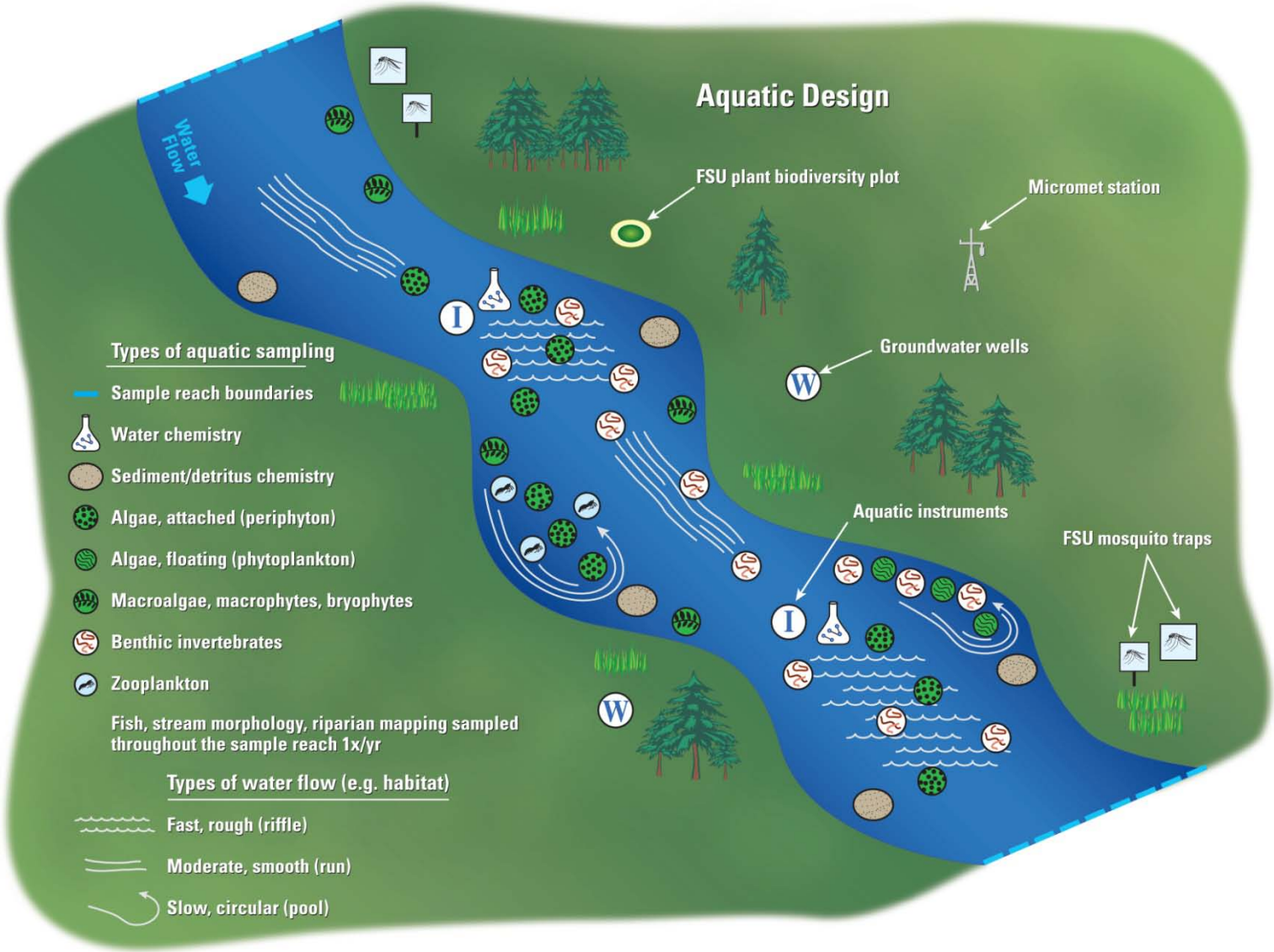




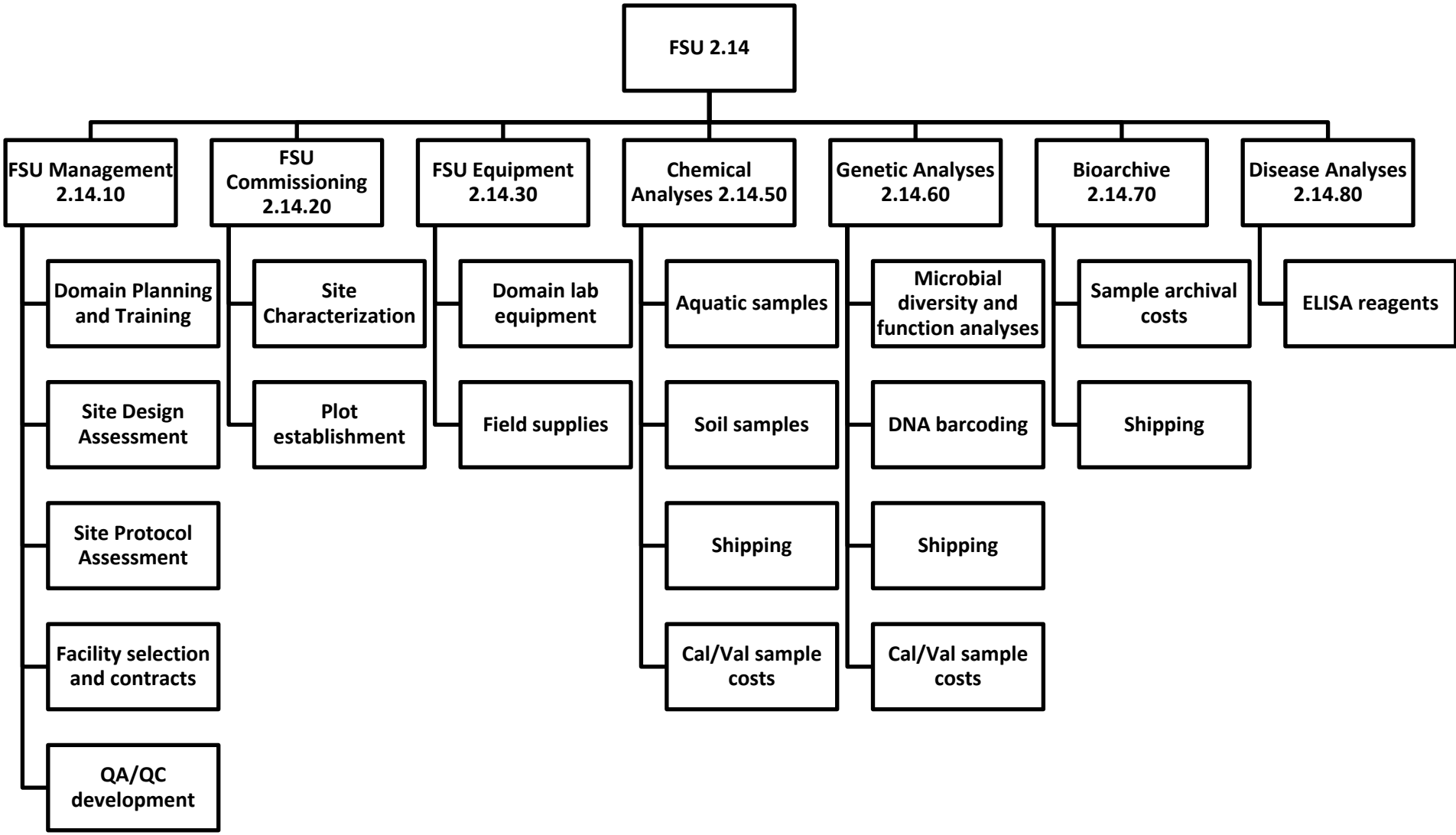
Field Design



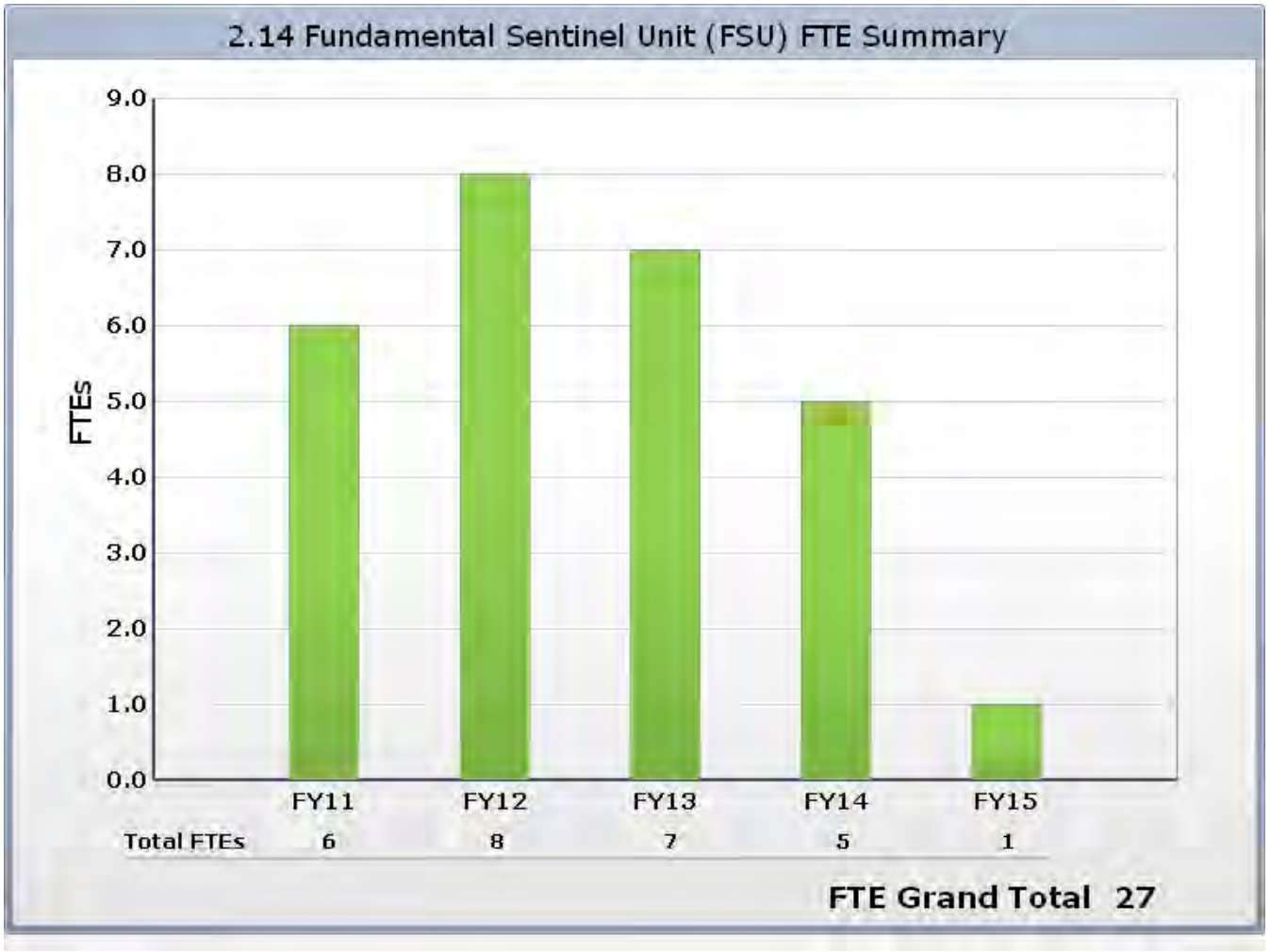
Field Design



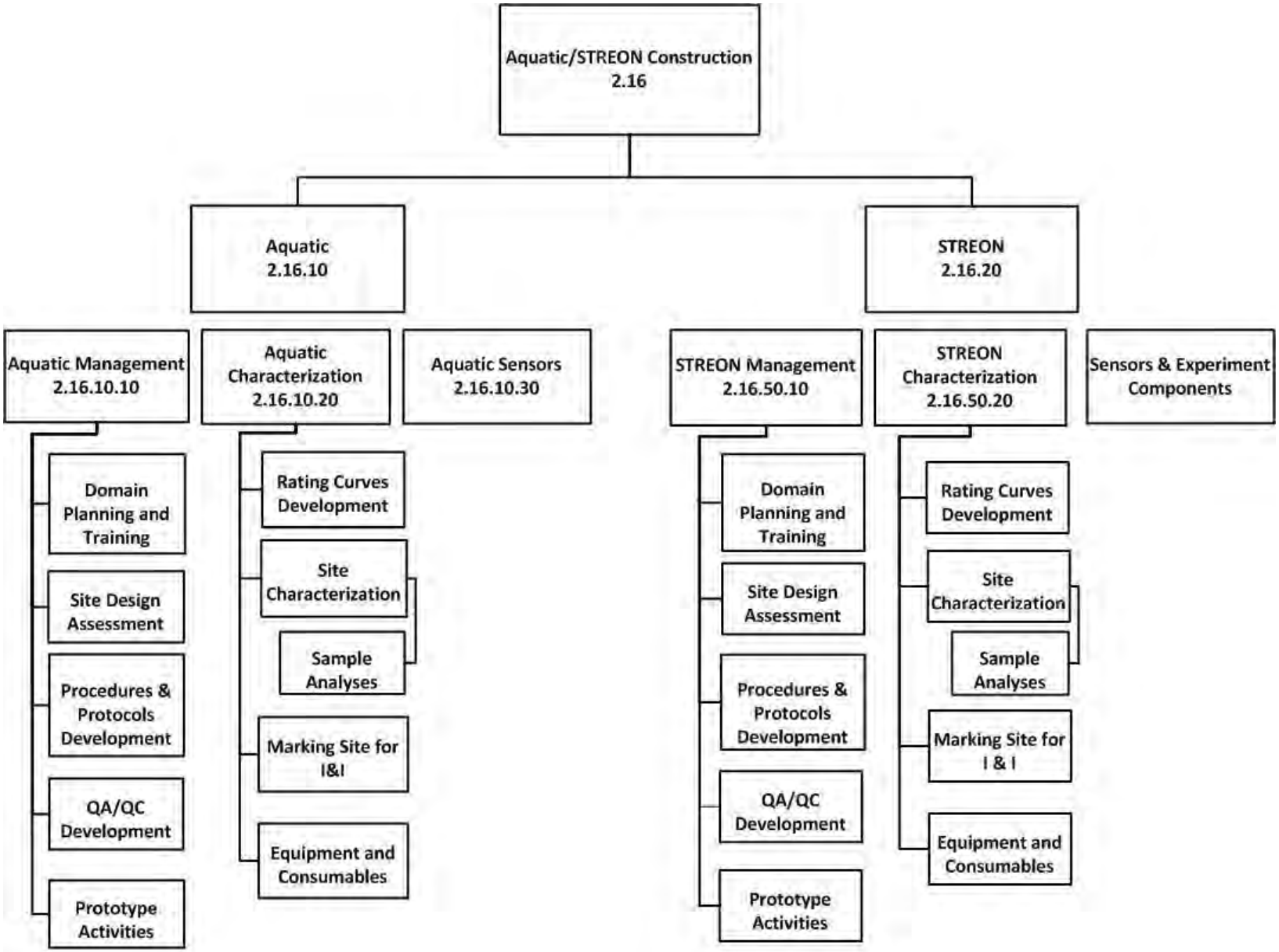
FSU WBS


FSU 2.14
FSU Management 2.14.10
FSU Commissioning 2.14.20
FSU Equipment 2.14.30
Chemical Analyses 2.14.50
Genetic Analyses 2.14.60
Bioarchive 2.14.70
Disease Analyses 2.14.80
Domain Planning and Training
Site Design Assessment
Site Protocol Assessment
Facility selection and contracts
QA/QC development
Site Characterization
Plot establishment
Domain lab equipment
Field supplies
Aquatic samples
Soil samples
Shipping
Cal/Val sample costs
Microbial diversity and function analyses
DNA barcoding
Shipping
Cal/Val sample costs
Sample archival costs
Shipping
ELISA reagents

2.14 FSU - FTE Spread by FY



WBS - AQU


Aquatic/STREON Construction
2.16
Aquatic
2.16.10
STREON
2.16.20
Aquatic Management
2.16.10.10
Aquatic Characterization
2.16.10.20
Aquatic Sensors
2.16.10.30
STREON Management
2.16.50.10
STREON Characterization
2.16.50.20
Sensors & Experiment Components
Domain Planning and Training
Site Design Assessment
Procedures & Protocols Development
QA/QC Development
Prototype Activities
Rating Curves Development
Site Characterization
Sample Analyses
Marking Site for I&I
Equipment and Consumables
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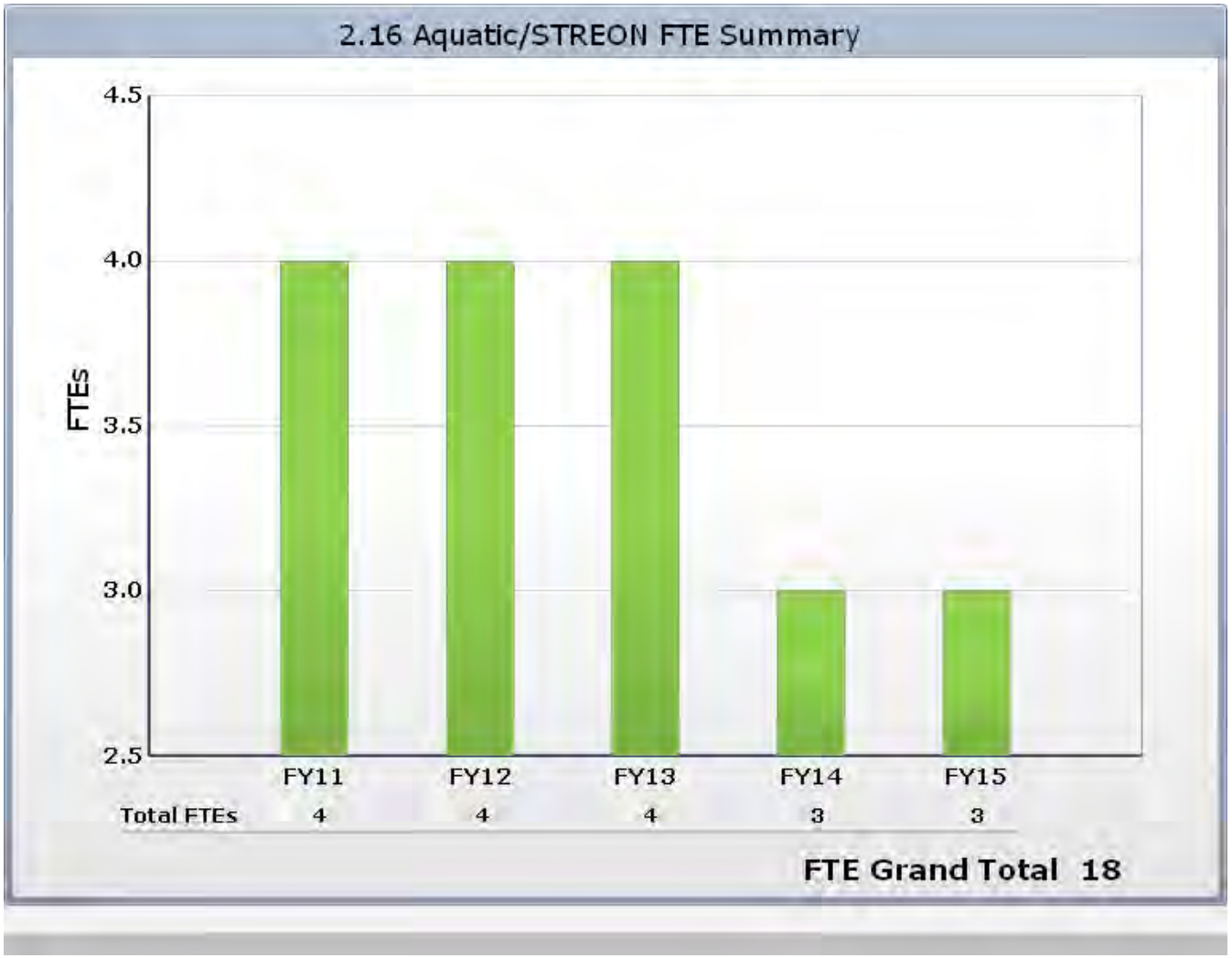
2.16 AQU/STR - FTE Spread by FY



Major Tasks, Milestones, Contracts and Procurements

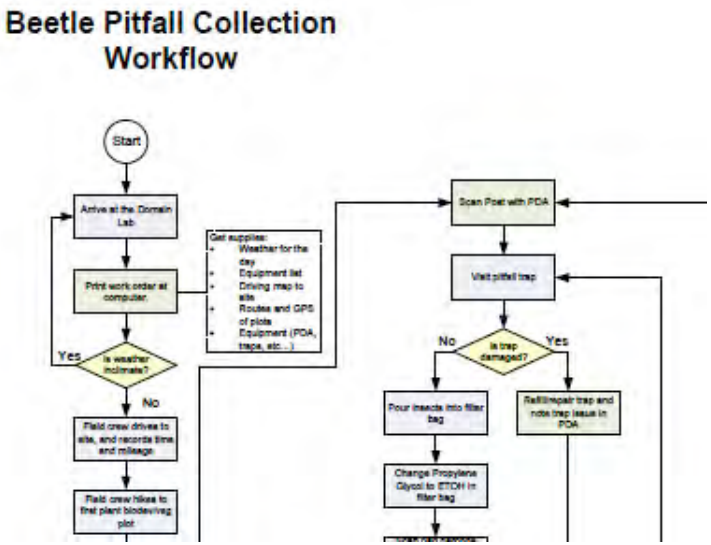
Task	Contract or Procurement
Site Characterization	Field Crew Contracts
Domain Lab Configuration	Domain and Field Equipment
DNA Barcode Library Development	Bioarchive and Genetic Facility Contracts
Operations Analytical Facilities Identification	Analytical Facility Contracts
Development of Operations Plans	

FSU Critical Operations Tasks

Operations Tasks	Description
Management	• Personnel & budget • Data QA/QC • Design analysis and adaptation • Data products • Science support
Bioarchive	• Sample storage • Sample shipping
Sample Analyses	• Chemical • Isotopic • Genetic • Disease
Field Operations	• Contracted field crews • Field crew training • Field supplies

Field Operations Management

- NEON Headquarter (HQ) and Domain staff shall manage NEON Field Operations
- Domain Director will oversee field activities
- HQ Operations group will manage Domain Director
- FSU, AQU staff coordinate with Operations to revise protocols/equipment/training



FSU PT Risk Register

Risk ID	Risk Title	Description	RRS	Risk Exposure	Occurrence Cost	Program Area	Status
118	Field Staff Recruiting	Difficulty recruiting qualified staff and contracted labor at field sites to perform FSU field tasks, possibly due to insufficient salaries or staff to do recruiting	2.5	High	$ 150,000	FSU	Monitor
125	PDA Development	Provided PDA device to automate data collection, sample labeling, location information, and photos does not adequately meet the needs for FSU. This would lead to longer data input by field crews and increased staff time to review data for data quality. Cost Impacts: Cost accounts for re-development of a new PDA plus additional Staff and field crew time until a sufficient PDA is delivered to FSU	2	Medium	$ 500,000	FSU	Mitigate
126	Weather Related Field Delays	Weather delays may lead to an increased number of field days or data gaps.	1.5	Medium	$ 150,000	FSU	Monitor
121	Bioarchive Contracts	Insufficient storage available at outsourced facilities, resulting in NEON needing to store samples in own facilities	1.2	Medium	$ 300,000	FSU	Monitor
123	Isotopic Facilities Contracts	Inability to obtain appropriate contracts to outsource the FSU isotopic analyses, due to insufficient funds or lack of facilities agreeing to NEON terms	1.2	Medium	$ 150,000	FSU	Monitor
155	Domain Lab Operation	Timely completion of domain lab set up and successful operation of power, equipment, resources, resulting in either delay in transition to operations or leasing of existing lab space	1.2	Medium	$ 500,000	FSU	Monitor
156	SOP Not Followed	Standard Operating Procedures are not followed properly resulting in bad data collection, data gaps, and lost samples	1	Medium	$ 50,000	FSU	Monitor
157	Sufficient Storage	Sufficient storage is required for spare/replacement parts and samples prior to shipping.	0.9	Medium	$ 150,000	FSU	Monitor
122	Genetic Facilities Contracts	Inability to obtain appropriate contracts to outsource the FSU genetic analyses, due to insufficient funds or lack of facilities agreeing to NEON terms	0.4	Low	$ 150,000	FSU	Monitor
124	Chemical Facilities Contracts	Inability to obtain appropriate contracts to outsource the FSU chemical analyses, due to insufficient funds or lack of facilities agreeing to NEON terms	0.4	Low	$ 150,000	FSU	Monitor

AQU PT Risk Register

Risk ID	Risk Title	Description	RRS	Risk Exposure	Occurrence Cost	Program Area	Status
151	Sufficient and experienced temporary labor	Sufficient personnel (temporary labor) with specific qualifications is required at each site to complete Aquatic/STREON tasks. In particular, fish sampling and rating curve development/verification requires prior experience. If personnel are not available in some domains, Aquatic/STREON will either have to pay travel costs for personnel to travel between domains or may have to pay a higher rate (e.g. contract a higher skilled person at a higher rate who is available).	2.5	High	$ 200,000	AQU	Monitor
138	Domain Lab Operations	The domain lab must be constructed, staffed, and stocked with equipment and consumables in order for Aquatic/STREON to operate a site. A space to store equipment and process samples is required for Aquatic/STREON site characterization, but this space can be rented.	2	Medium	$ 300,000	AQU	Monitor
140	CI is ready to accept data from site characterization	If CI is not able to accept data from site characterization, there may be a cost increase to process and QC data by HQ staff	1.5	Medium	$ 300,000	AQU	Monitor
152	Instrument Arrays not functional	The more often instruments are not working properly, the more data will be lost. Instrument down-time may result from flash flooding, drying, electrical failures, sensor fouling, accidental removal from stream or pond. Instrument down time will result in a loss of data products and ability for Aquatic/STREON to track changes in drivers of ecological change.	1.4	Medium	$ 100,000	AQU	Monitor
136	Outsource Facility Capacity	Insufficient capacity available at outsourced facilities, resulting in delay of data return to NEON	1.2	Medium	$ 800,000	AQU	Monitor
139	Permits to access sites, collect and ship samples	Permits to access sites; gather and ship chemical and biological samples are required prior to site characterization and operations. Without permits, Aquatic/STREON cannot construct or operate sites	1.2	Medium	$ 100,000	AQU	Monitor
141	Weather Related Field Delays	Weather delays may lead to an increased number of field days or data gaps	0.9	Medium	$ 300,000	AQU	Monitor
143	Experiment Disruption	Inconsistency in treatment effect (nutrient addition or continuous electrical exclosure) due to disruption	0.9	Medium	$ 200,000	AQU	Monitor
144	Nutrient Availability	Disruption of availability or shipment of nutrient stock solution to domains	0.9	Medium	$ 200,000	AQU	Monitor
137	Safety Issues	Field crews that are not properly trained in or follow field and lab safety procedures may result in personal injury, loss of equipment and data.	0.6	Low	$ 100,000	AQU	Monitor

STREON Experiment Design

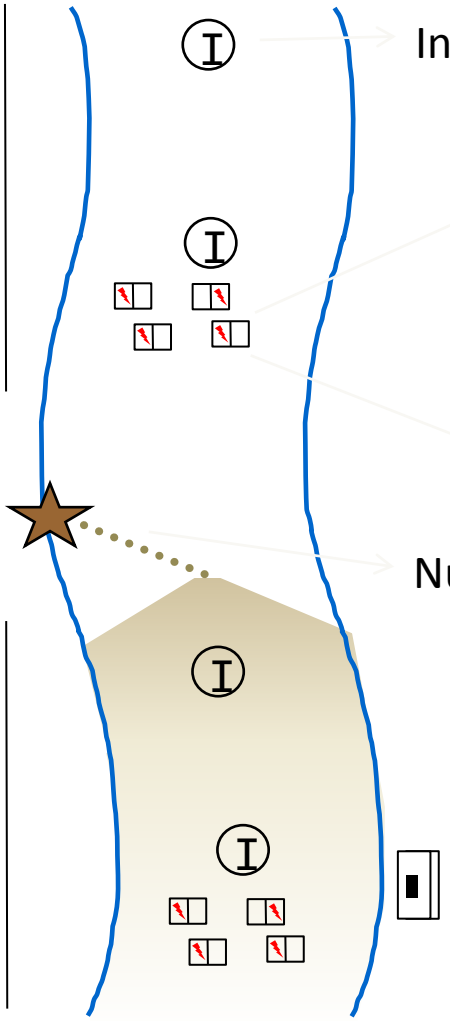
NEON control reach

X_O

water flow

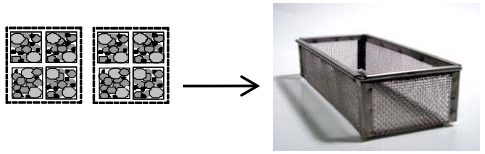
STREON treatment reach

X_E



Instrument station, water sampling site

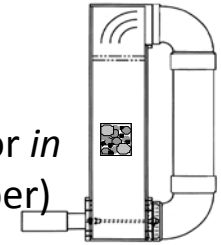
Experimental units (baskets)



Consumer exclosure
(electrified barriers)

Nutrient addition station

Basket incubation
(e.g. streamside flume or *in situ* recirculation chamber)



PDR Issues and Progress

Issue	Progress
Bioarchive policy & fees	– Distributed survey of costs and policy; positive response to fee structure and use policy
Sample Design	– Statistical analysis of sample size; breakdown of operations tasks calculations
Site characterization	– Soil scientist contracted to develop plan
Bioarchive closing	– Added risk to risk register
Sample use	– Sample Use Policy

Bioarchive Policy

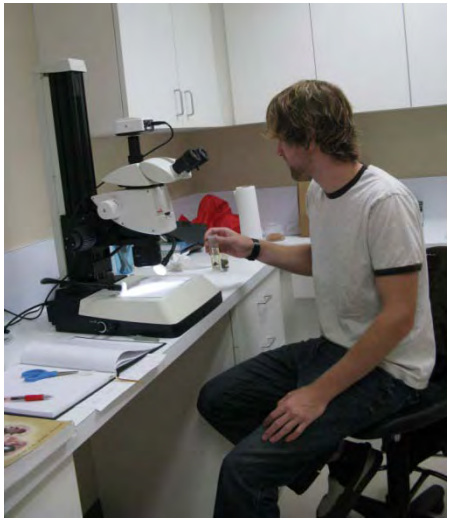
- Policy, fee structure and survey sent to ~50 institutions
- Positive to fees proposed and use policy

- Development of CI database and user interface required prior to further development of sample management policy and contracts

Future Work

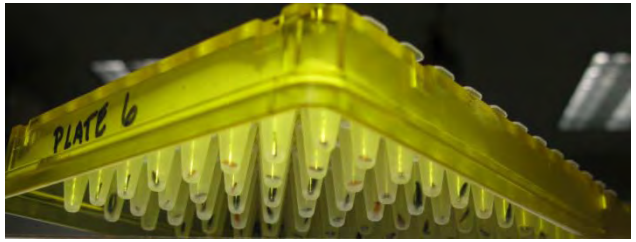
- Microbial Sampling Prototype: summer 2009 - 2010
- DNA Barcode Library Development Prototype: summer 2009 - 2010
- DNA Technology Prototype, Sandia National Labs: fall 2009-2010
- PDA Technology Assessment: summer 2009
- Site Characterization: spring 2010
  - Protocol development
  - Contracts for field crews, analytical labs and bioarchive

Summary



- Main tasks during construction include
  - Site characterization
  - DNA barcode library development
  - Site Specific Designs
  - Plot Establishment

- Prior to construction, several risk mitigation activities
  - DNA barcode library prototype
  - Microbial sampling design prototype



- Preparing for construction Spring 2010:
  - Field procedures and protocols
  - Contracts
  - Existing data acquisition

The National Ecological Observatory Network is a project sponsored by the National Science Foundation and managed under cooperative agreement by NEON Inc.