FLUXNET-SpecNet Workshop

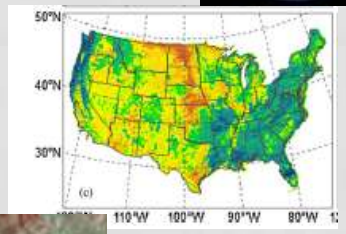
June 7-9, 2011
Berkeley, CA

DEMOGRAPHICS

- 145+ Participants
  - Mix of Senior and Junior Scientists, Postdocs and Students from North and South America, Europe, Asia and Australia (16 countries)
  - Representing flux, hyper spectral and satellite remote sensing, modeling, instrument and data informatics communities
- 4 Wangs, 3 Kims and 2 Zhaos

Why WE are Here?

Globe: 10,000 km (10^7 m)

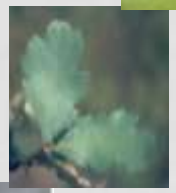


Continent: 1000 km (10^6 m)

Landscape: 1-100 km

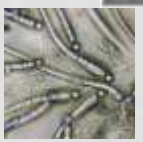
Canopy: 100-1000 m

Plant: 1-10 m



Leaf: 0.01-0.1 m

Stomata: 10^{-5} m



Bacteria/Chloroplast: 10^{-6} m

Big-Picture Question

- How can We Produce Defensible Data on the 'Breathing of the Biosphere' that Represents Flux Information that is 'Everywhere, All the Time?'

MODIS OPERANDI— WHAT IS IN OUR TOOL-BOX?

Eddy Covariance Flux Measurements

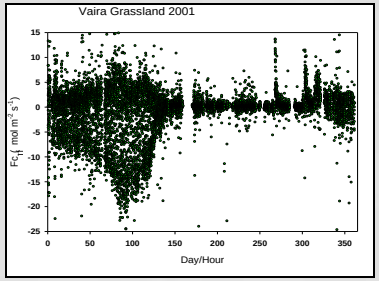
Regular Hyper-Spectral Reflectance and Digital Camera Measurements

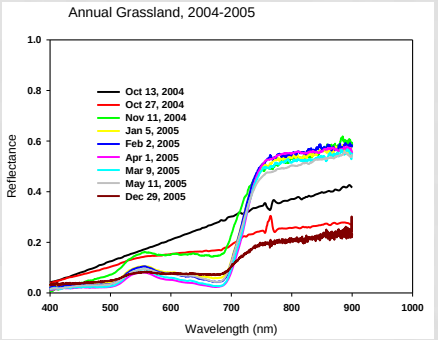
Satellite Remote Sensing

Radiative Transfer Models

Soil-Atmosphere-Vegetation Transfer Models

Data Informatics





Goals and Objectives

1. Combine hyperspectral remote sensing and flux time series measurements at co-located sites into a common database.

2. Increase the capacity of the FLUXNET community to measure canopy structure and phenology with remote sensing methods.
   - Examples include the use of digital cameras, broad band sensors based on LEDs or photodiode sensor and or hyperspectral reflectance on a regular basis with manual or automated systems.

3. Discuss protocols and pitfalls in measuring and interpreting flux and remote sensing measurements.

4. Discuss how to use data from the flux, optical sampling and remote sensing networks and remote sensing products to better upscale carbon and water fluxes in time and space.

5. Produce new generation of gridded fluxes and flux drivers for future synthesis activities at local, regional, and continental to global scales.

6. Address how good is good enough in upscaling fluxes with remote sensing and flux networks?

7. Discussion and plan future evolution and possible integration of FLUXNET and SpecNet

How Good Is Good Enough?

Can We Resolve +/- 1 PgC/y
Changes with a tool +/- 8-14 PgC/y?

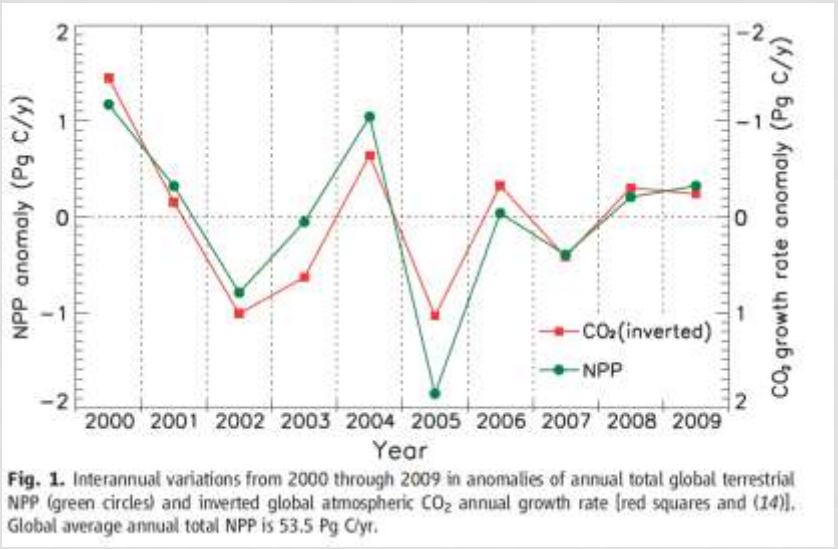
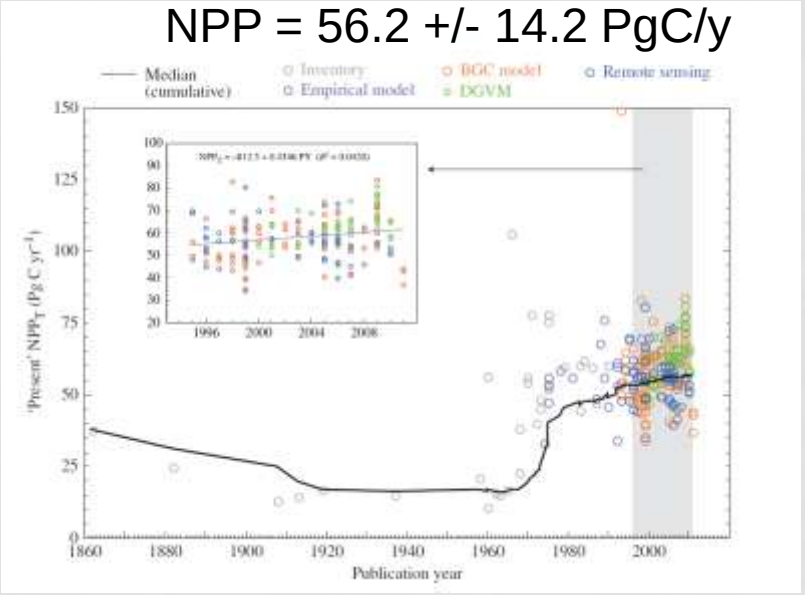


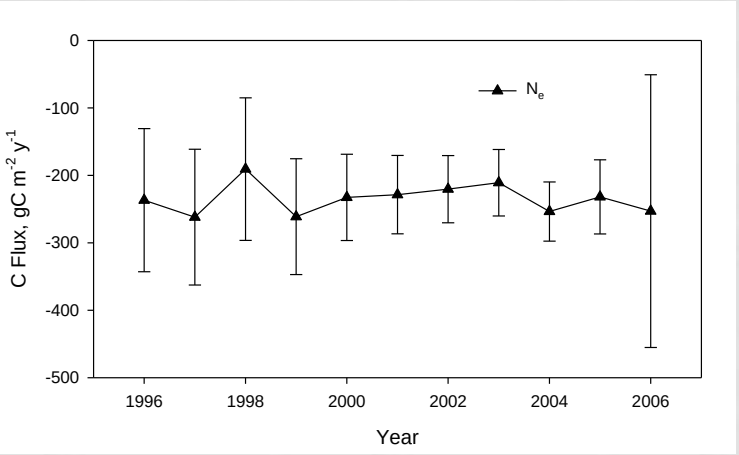
Fig. 1. Interannual variations from 2000 through 2009 in anomalies of annual total global terrestrial NPP (green circles) and inverted global atmospheric CO_2 annual growth rate [red squares and (*14*)]. Global average annual total NPP is 53.5 Pg C/yr.

Zhao and Running 2010, Science

NPP = 56.2 +/- 14.2 PgC/y



Ito, 2011. Global Change Biology



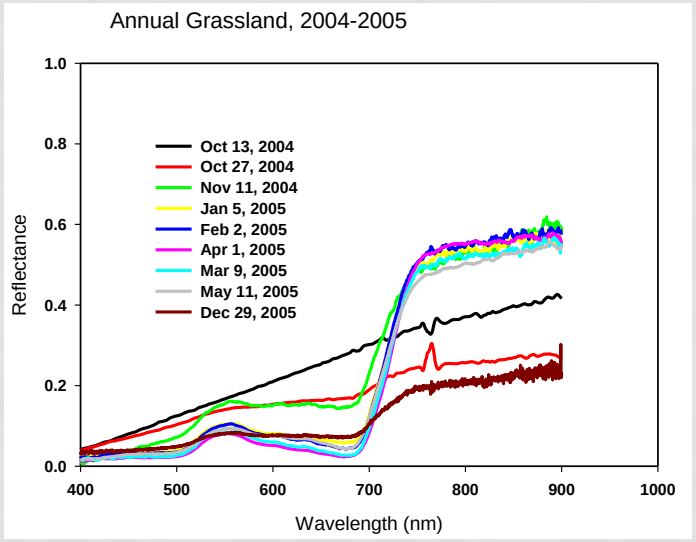
MEETING FORMAT

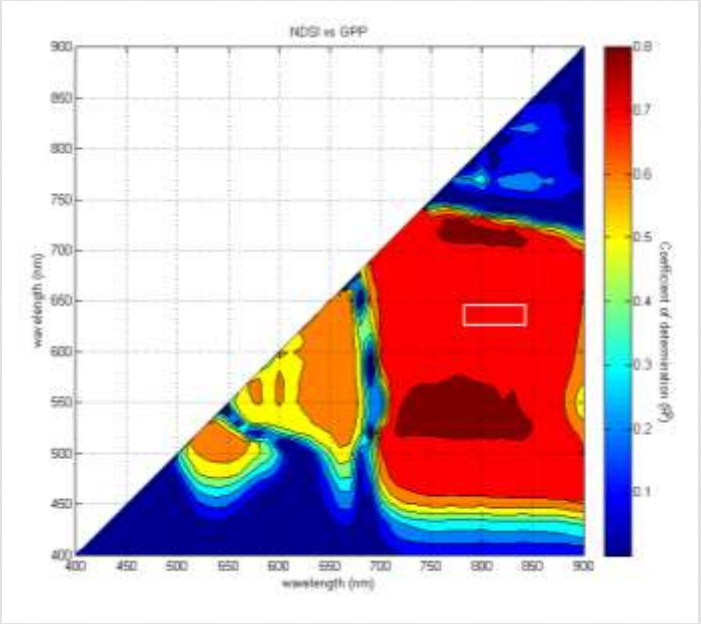
- Day One
  - Overview Talks
- Day Two
  - Discussion and Posters
- Day Three
  - Discussion, Synthesis and Planning

Eddy Covariance Provides High Frequency Flux Information at a Single Point;

FLUXNET extends this Information to 100s of Points

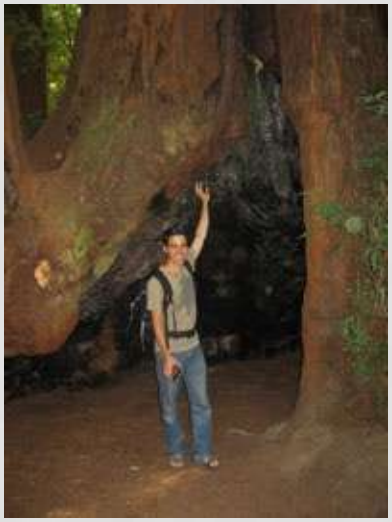
HyperSpectral Remote Sensing Data Reveals the State of Ecosystem Function and Structure



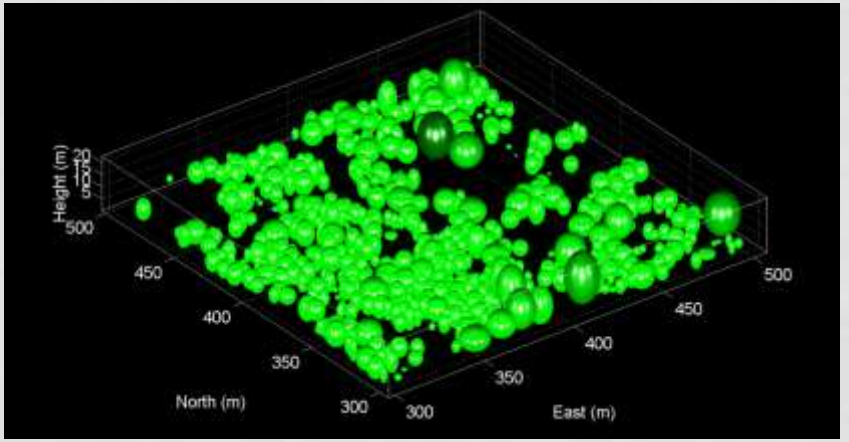


Measuring Temporal Variation in HyperSpectral Reflectance, Canopy Color and Light Transmission Reveals information on Phenology

deciduous broadleaf forest -Takayama, Japan, courtesy of PEN
http://pheno-eye.org/



Upscaling Eddy Flux and Hyper Spectral Remote Sensing Data from Leaf to Landscape Scales Requires Complex Information on Canopy Architecture and Spectral Reflectance and Advanced Radiative Transfer Models



Upscaling from Landscapes to the Globe

'*Space: The final frontier … To boldly go where no man has gone before*'

Captain James Kirk, Starship Enterprise

How to Merge Flux and Remote Sensing Data Products to Advance our Science?

Remote Sensing, Scientific Persian Rug:

Provides Spatial information on the Mosaic, Discrete in Time

Flux Measurements Are Continuous in Time. They can Validate on How 'Bright' the Pixels may Be and Generate Rules for Temporal Integration

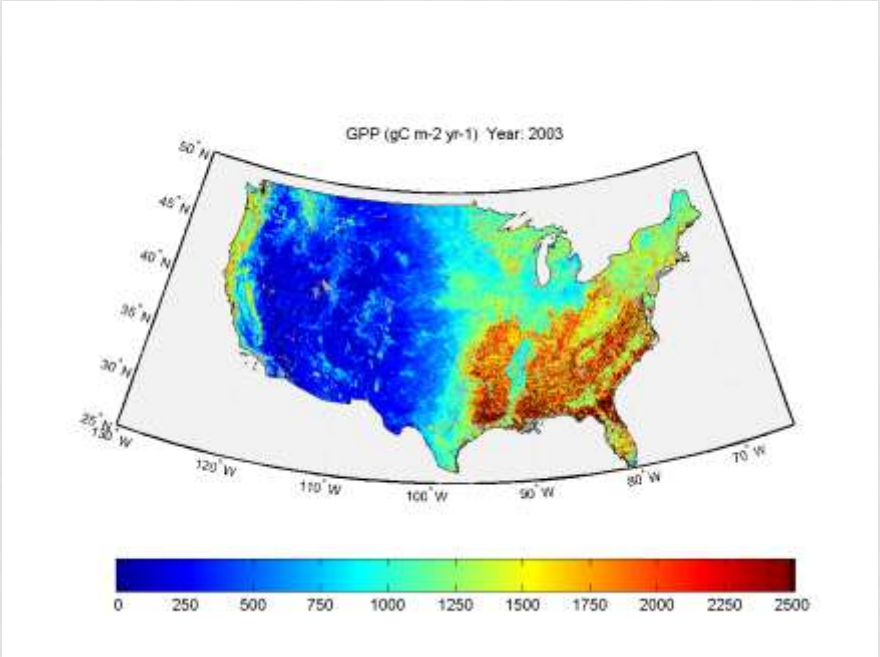
Challenge for Landscape to Global Upscaling

Converting Virtual ‘Cubism’ back to Virtual ‘Reality’

Merge Numerous Data Layers with varying:

- Time Stamps (hourly, daily, weekly)
- Spatial Resolution (1 km to 0.5 degree) and Data Sources (Satellites, Flux Networks, Climate Stations)

How-to and Pros and Cons of Spatializing Flux Data with Bottom-up Mechanistic Models and Data Assimilation



The Future: Reaching Out to User Communities and Stakeholders

Broad Discussion Topics

- Flux and Hyperspectral Remote sensing: Emerging vegetation indices and data products

- Fluxes, Hyperspectral Remote Sensing and Models

- Fluxes, Hyperspectral Remote Sensing and Upscaling

- Regional to Global Questions to be Addressed with Flux Networks

- Flux and Hyperspectral Remote sensing, merging data products, Future Directions

DEMOGRAPHICS

- 145+ Participants
  - Mix of Senior and Junior Scientists, Postdocs and Students from North and South America, Europe, Asia and Australia (16 countries)
  - Representing flux, hyper spectral and satellite remote sensing, modeling, instrument and data informatics communities
- 4 Wangs, 3 Kims and 2 Zhaos

VENUE

- Brower Center
  - Named after David Brower, former President of the Sierra Club
  - Green Building
- Meals (Breakfast and Lunch) and Coffee
  - Gallery and Terrace
- Posters
  - Tamalpais
- WiFi

WIRELESS NETWORK

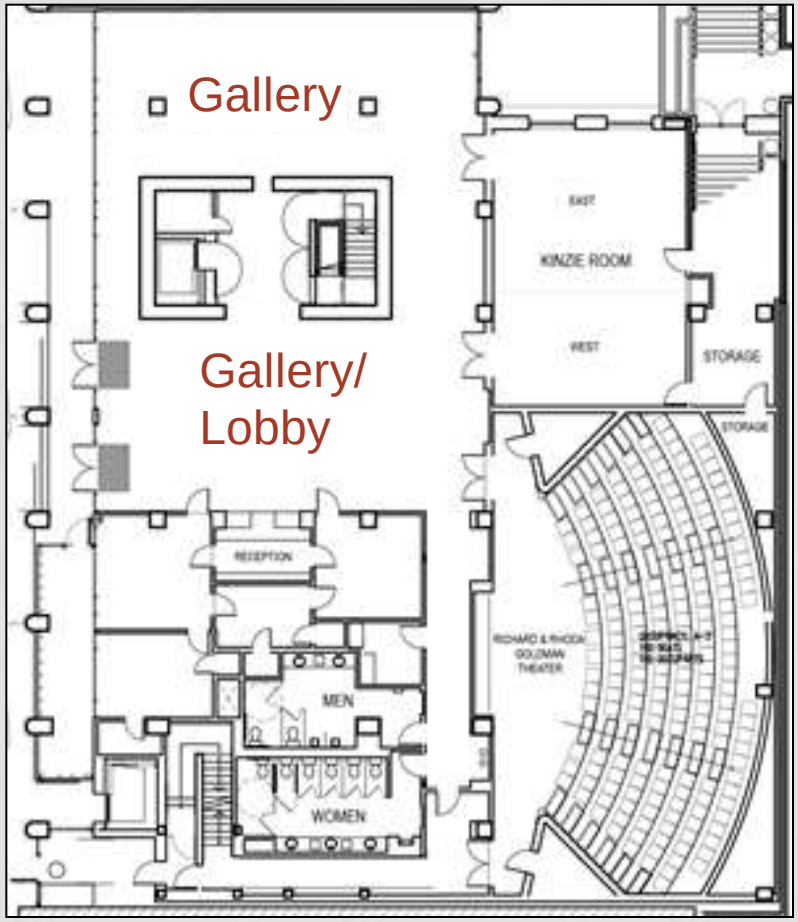
the network name is **DBCPublic**

password is **DBC322public** (case sensitive).

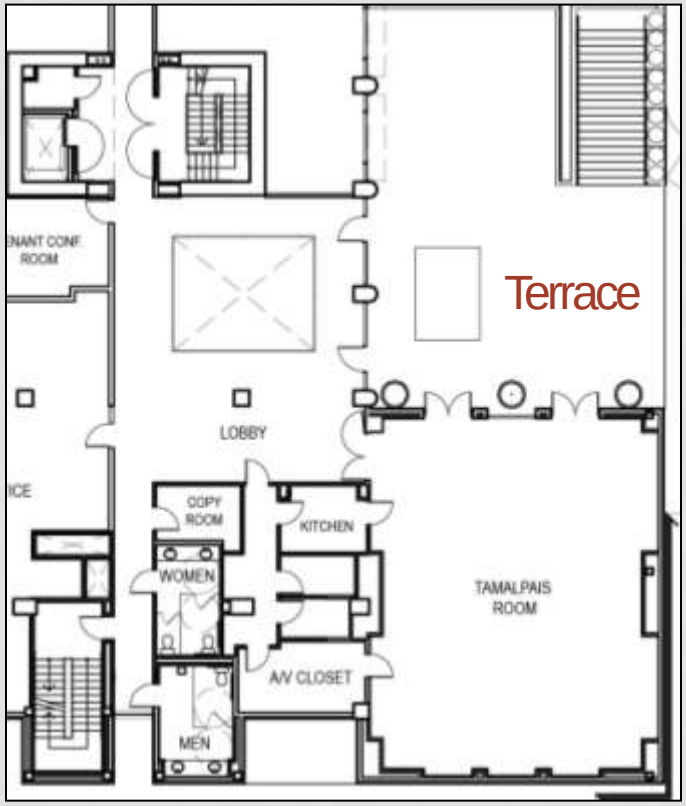
LOGISTICS

Meals and Coffee in the Gallery and on the Terrace

Ground Floor



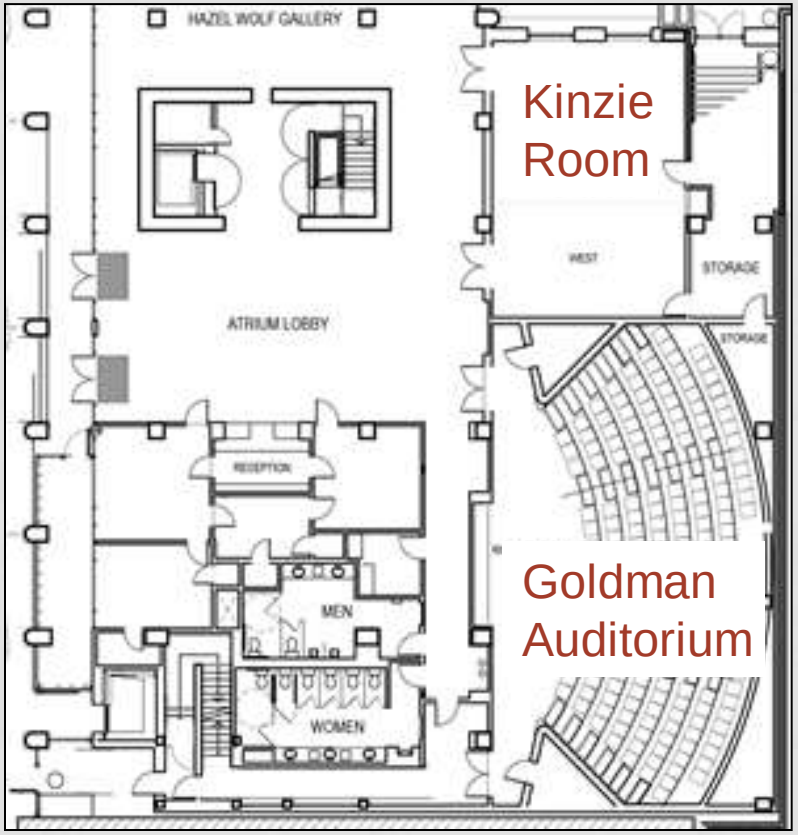
Second Floor



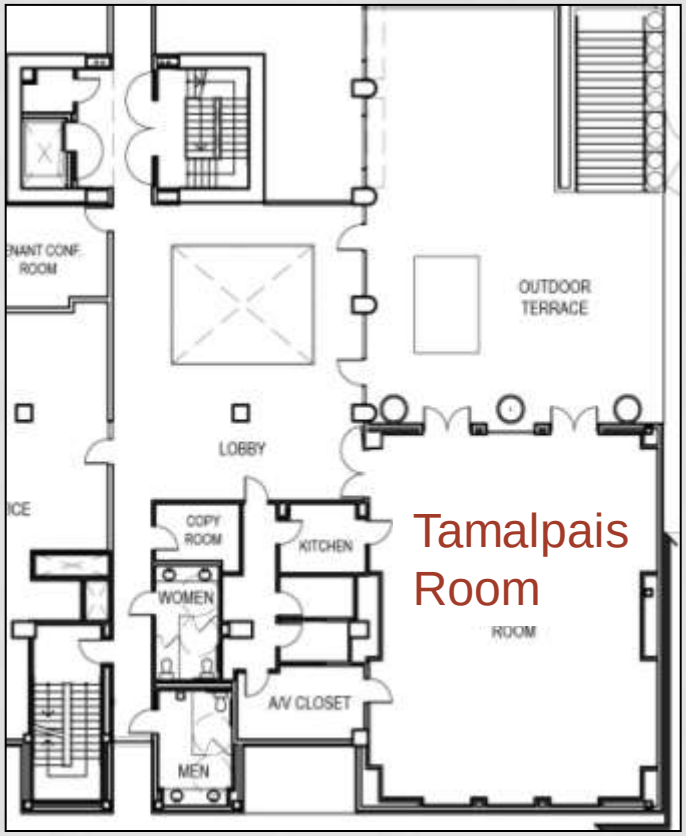
LOGISTICS

- Talks and panel discussion are in the Goldman Auditorium, the Kinzie Room and the Tamalpais Room.
- Posters are in the Tamalpais Room on Wednesday and Thursday. **Setup posters during lunch on Wednesday**.

Ground Floor



Second Floor



SPONSORS

- NSF Research Coordinated Research Networks
- Microsoft
- Travel
  - ILEAPS, COST, NASA

THANKS

- Co-Organizers
  - Laurie Koteen, Markus Reichstein, Dario Papale and John Gamon
- Administration
  - Jaclyn Hatala, Melanie Hahn, Siyan Ma, Naama Raz-Yaseef, Nicole Lepoutre-Baldocchi
- Food and Wine
  - TrumpetVine Catering
  - Microsoft

THE DAVID BROWER CENTER

A non-profit organization that is a model of environmental design and sustainable use practices.

A venue that houses and supports socially progressive, environmentally-conscious organizations and individuals.

A gathering space for the non-profit, environmental and academic communities and institutions.

An art gallery for art with an environmental bent.

DAVID BROWER

- A Berkeley native, David Brower was a pioneering environmentalist, environmental activist and conservationist.
- President of ‘The Sierra Club’ in the 1950s and 60s during the genesis of the American environmental movement.
- Founder or co-founder of Friends of the Earth, The Earth Island Institute and the League of Conservation Voters.
- A talented teacher, communicator and advocate.