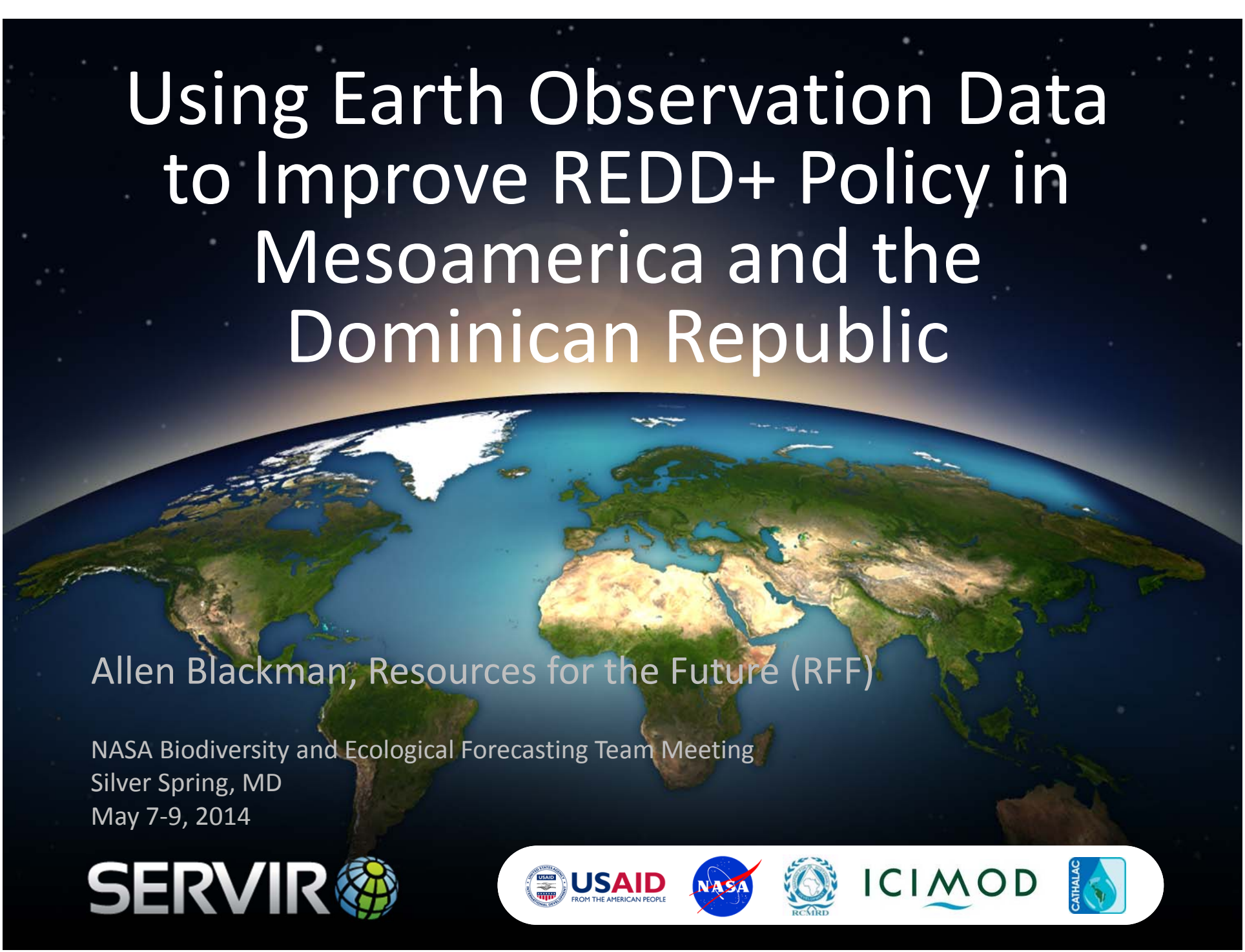
Using Earth Observation Data to Improve REDD+ Policy in Mesoamerica and the Dominican Republic



Allen Blackman, Resources for the Future (RFF)

NASA Biodiversity and Ecological Forecasting Team Meeting
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SERVIR

USAID FROM THE AMERICAN PEOPLE

NASA

RCMRD

ICIMOD

CATHALAC

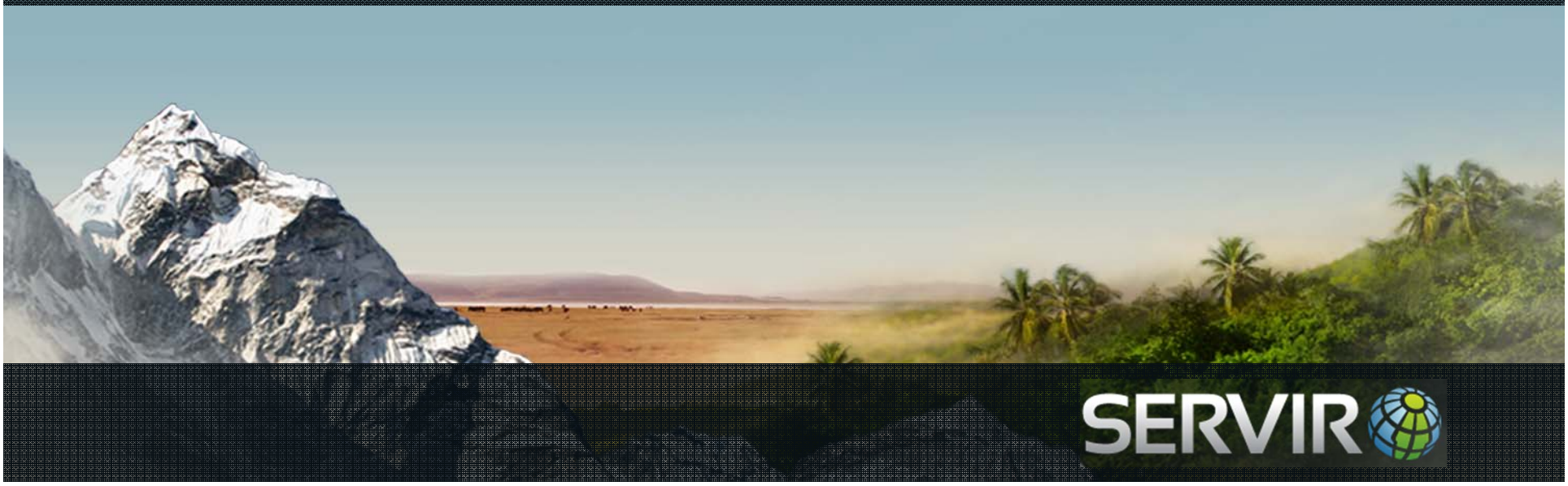
SERIVIR

- What is it?
  - Joint intiative among NASA, USAID and regional organizations in developing countries
- What does it do?
  - “Connect space to village”
- How?
  - Uses satellite-based Earth observation data and science applications
- Why?
  - To help improve environmental policy in developing countries.

Outline

- Project overview
- Evaluation tool kit
- Targeting tool

Project Overview



Motivation

- Deforestation in Latin America & Caribbean remains "alarmingly high" (FAO)
  - 0.5% per year 2000-2010; 5 times the global rate
- A major contributor to climate change
  - 7% global GHG emissions
- Additional adverse impacts
  - loss of biodiversity & hydrological services, soil erosion,
- But forest conservation resources are scarce
- Therefore, need to boost their "bang for the buck"

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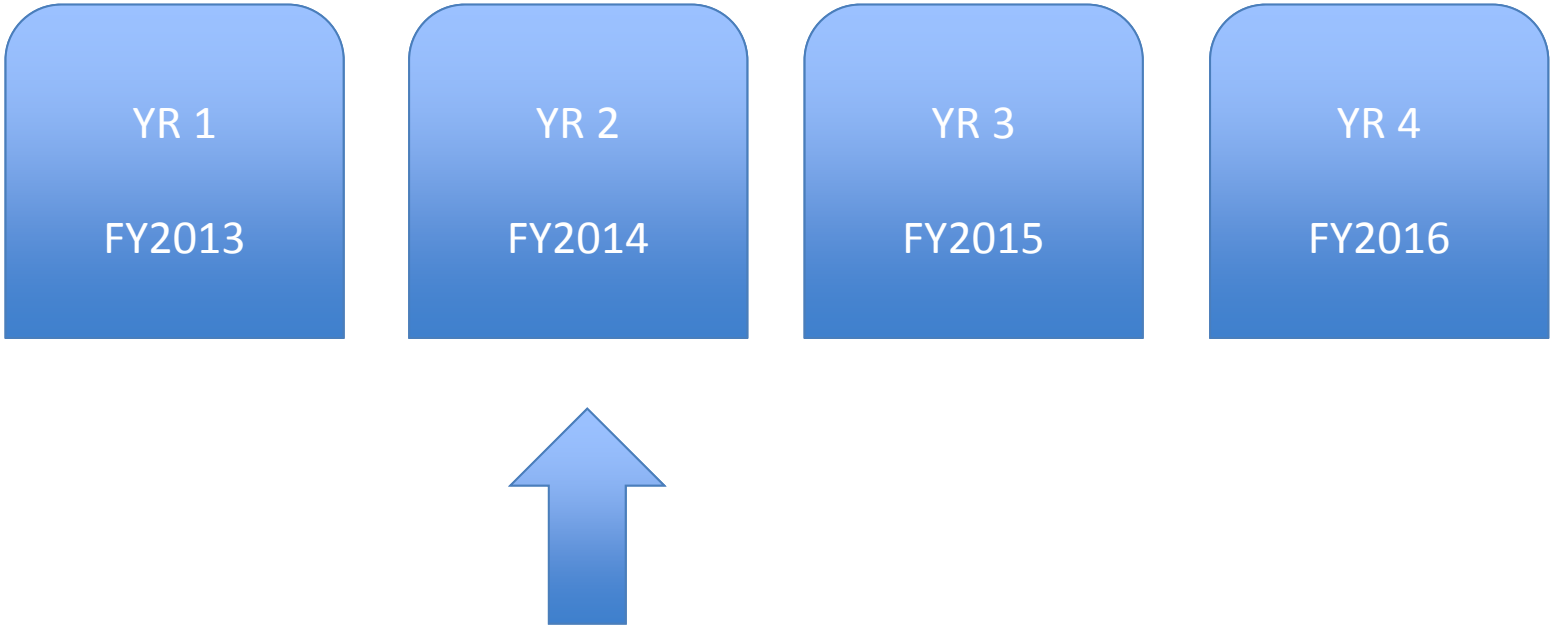
Broad objective

Develop decision tools for improving the efficiency and effectiveness of forest conservation policy in Mesoamerica and the Dominican Republic

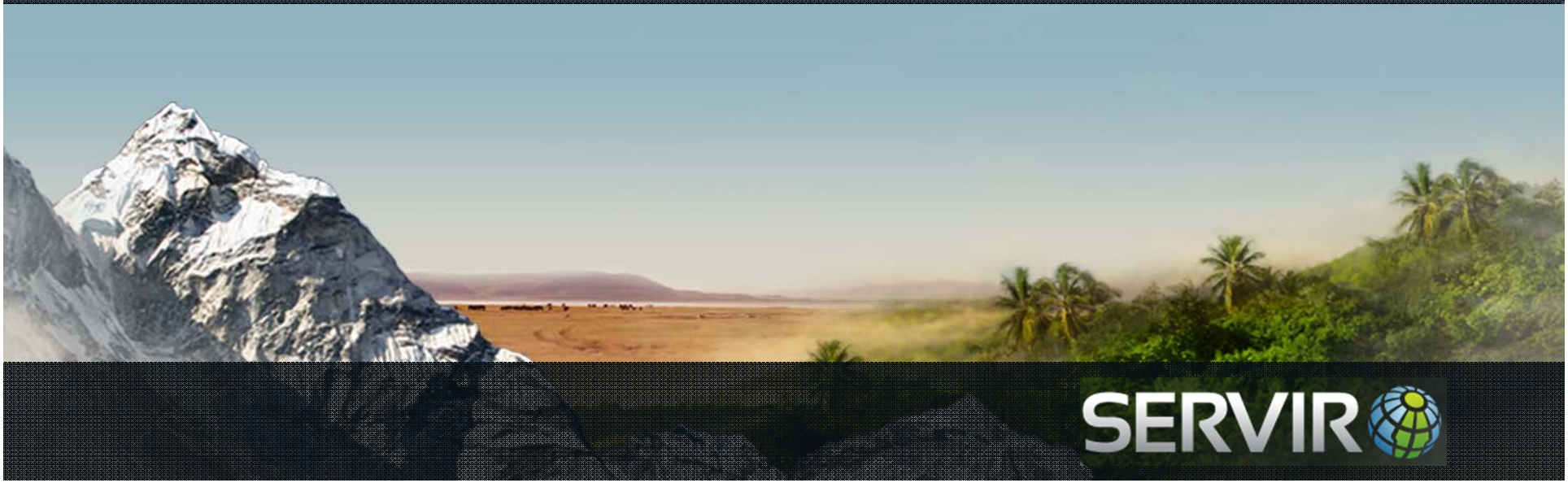
Team

- Resources for the Future
  - Allen Blackman (PI)
  - Juha Siikamäki (Co-I)
  - Len Goff (RA)
  - Jessica Chu (RA)
- University of Maryland, Department of Geography
  - Matt Hansen (Co-I)
  - Peter Potapov (Co-I)
  - Yamile Talero (RA)
- SERVIR Hub
  - CATHALAC (regional center for Mesoamerica)

Timeline



Evaluation Tool Kit



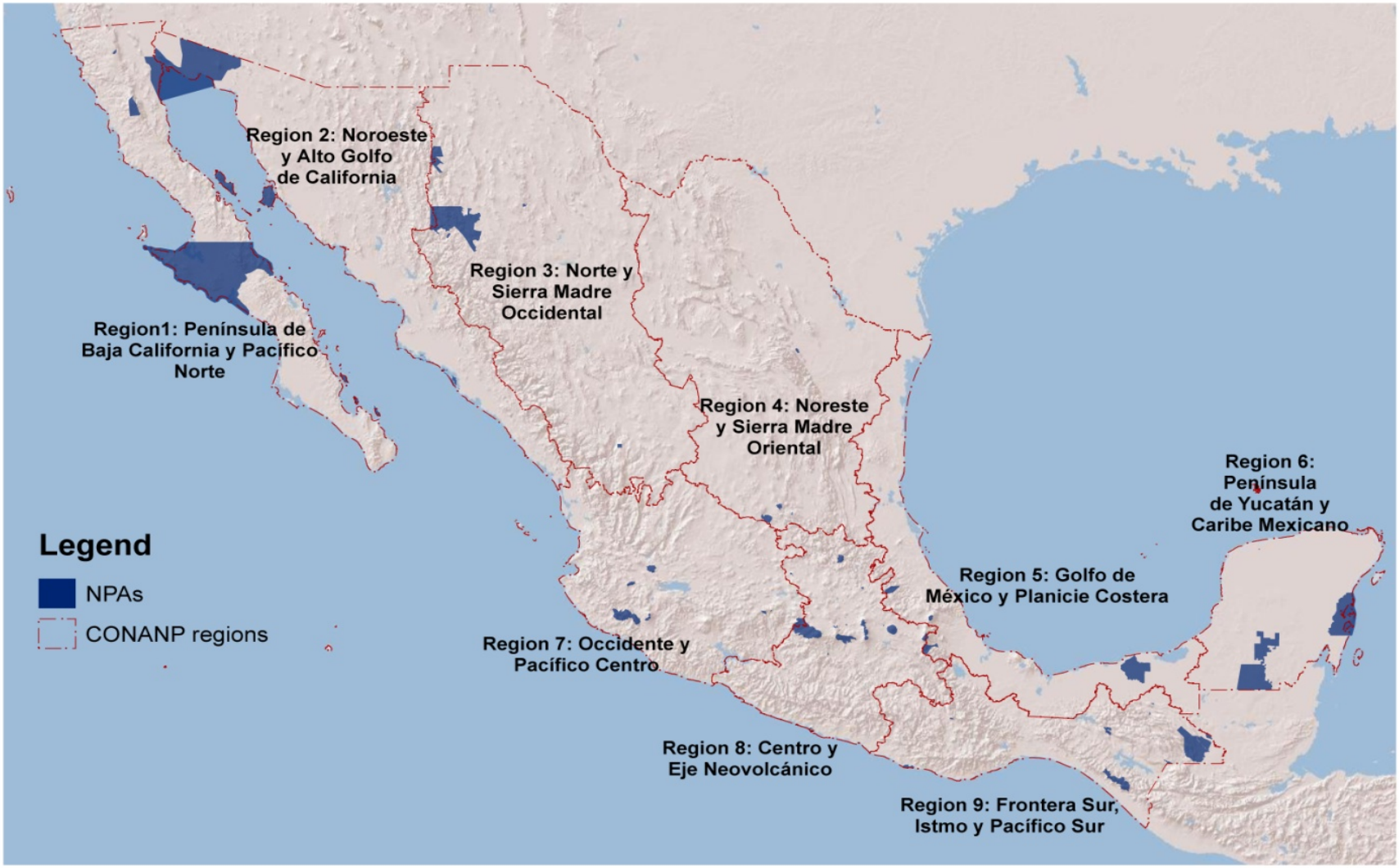
Rationale

- Question: How effective are specific forest conservation policies in stemming forest cover change?
  - protected areas, payments for environmental services, forest certification, community forestry, etc.
- Conventional approach
  - Compare forest cover change inside and outside project sites
  - Problem: projects tend to be located in remote areas with minimal deforestation … therefore simple comparisons conflate effects of policy, and of policy's location
- More rigorous approach
  - Compare remotely sensed rates forest cover change in project area to rates on observationally similar sites
  - Use regression and/or covariate matching

Example #1: Paper parks in Mexico

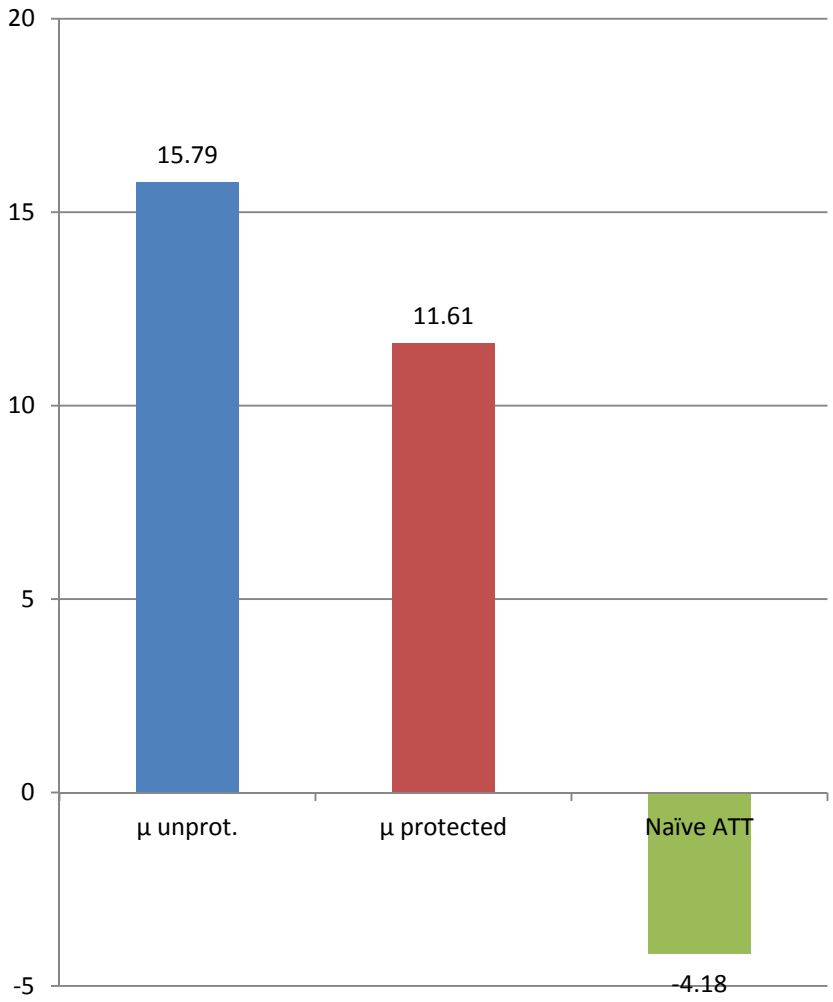
- Broad question
  - Do “paper parks” (protected areas without funding or management) stem deforestation?
- Specific question
  - Did Mexican parks stem deforestation 1993-2000?
- Key data
  - Forest cover change 1993-2000
  - Geophysical, socioeconomic, institutional land characteristics
- Empirical approach
  - Propensity score and covariate matching

Natural protected areas created prior to 1993

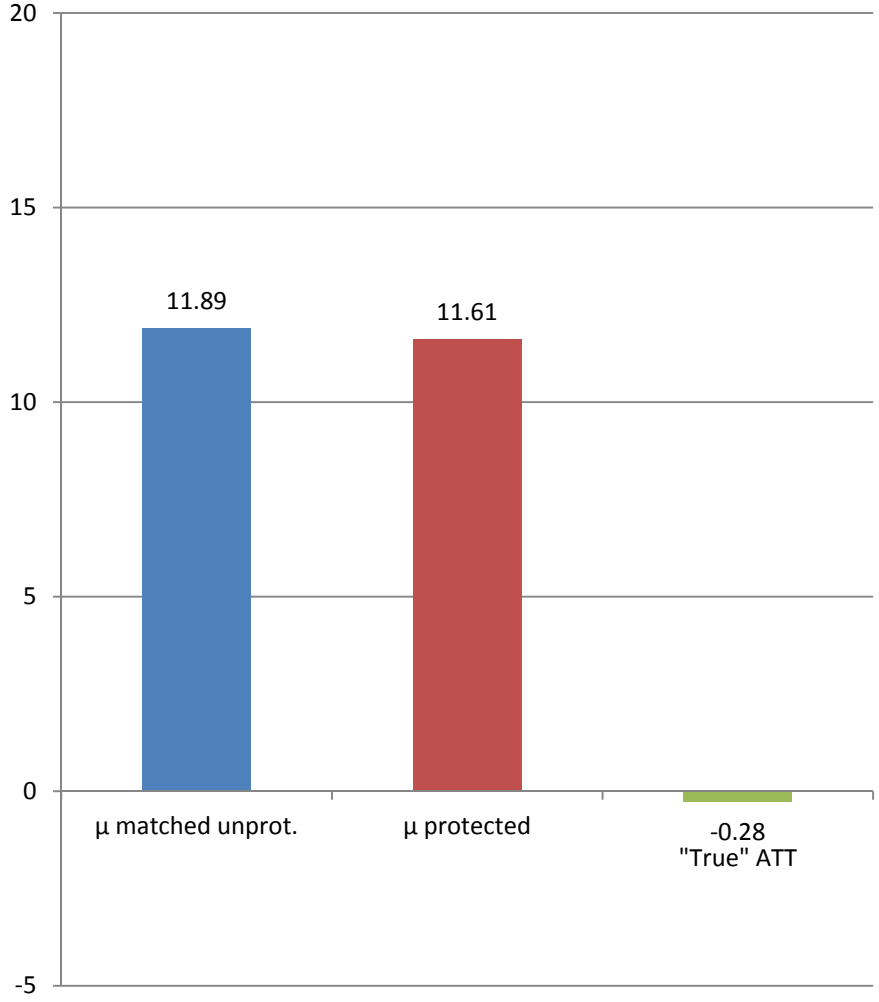


Effect of protected areas on deforestation 1993-2000

Naïve effect



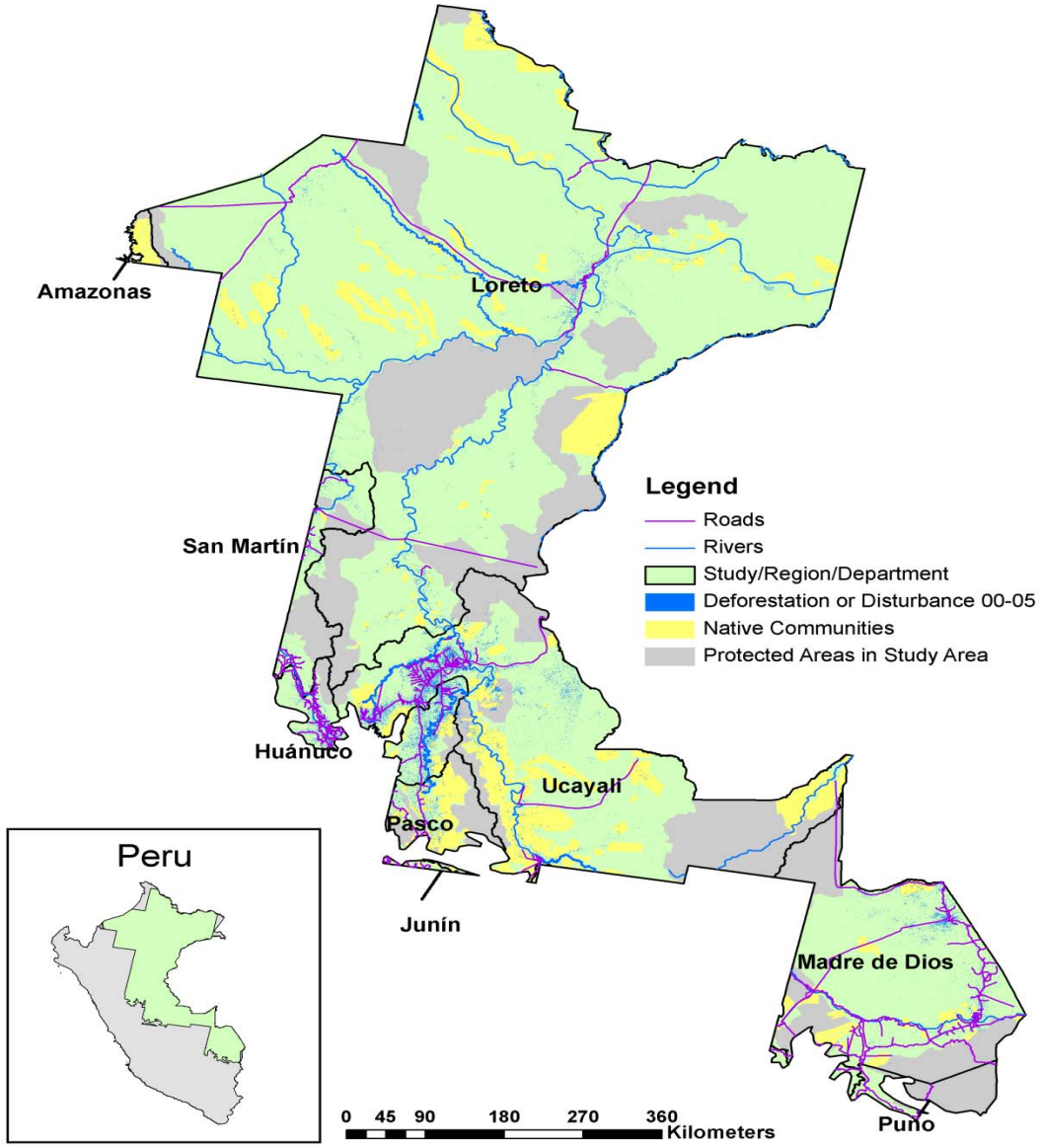
"True" Effect



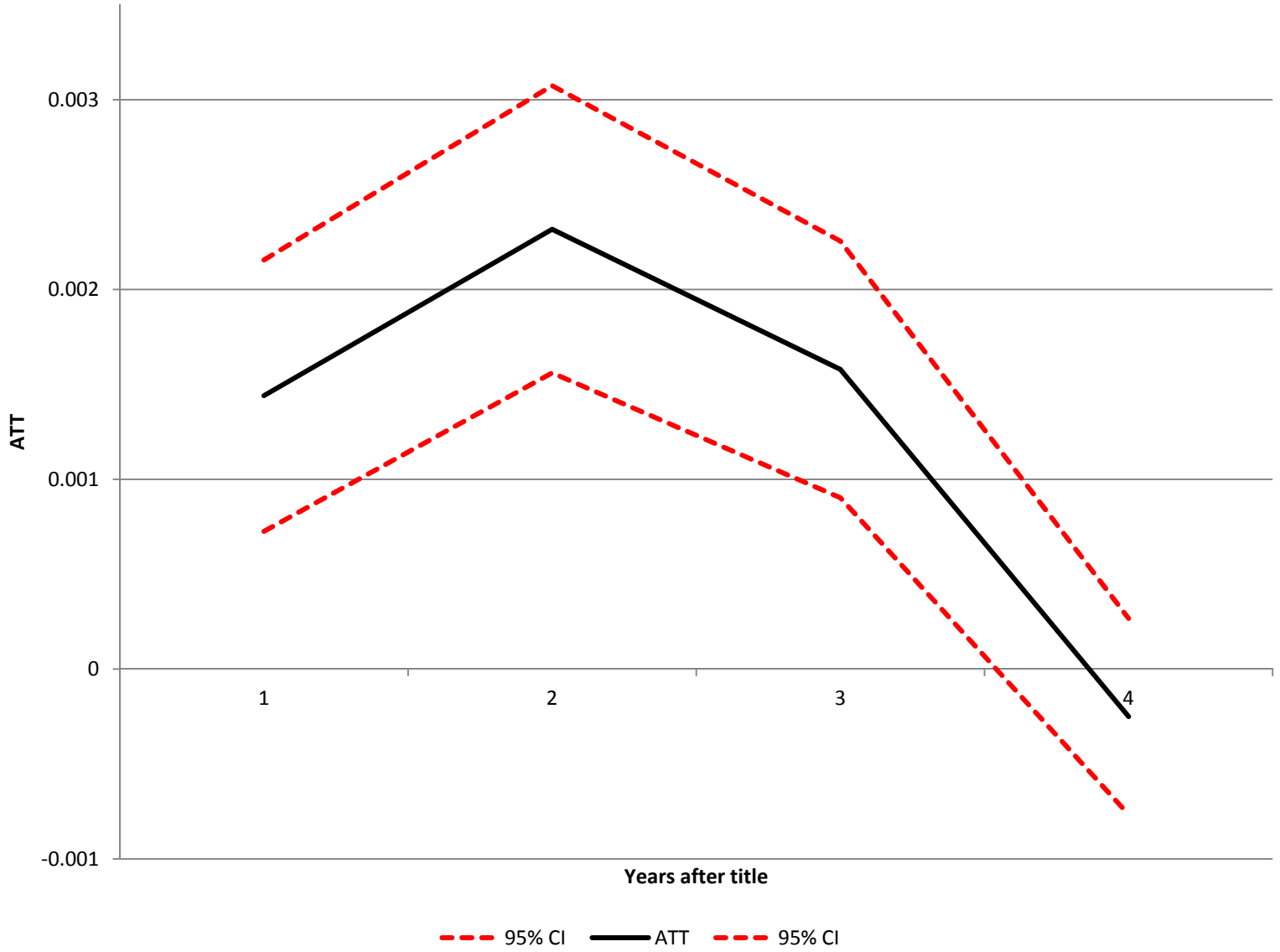
Example #2: Titling native communities in Peru

- Broad question
  - Does decentralization of authority for forests stem forest cover change?
- Specific question
  - Has the titling of 1200 native communities in the Peruvian Amazon between 1995-2005 stemmed forest cover change between 2000-2005?
- Key data
  - Annual deforestation and degradation 2000-2005
  - Geophysical, socioeconomic, institutional land characteristics
- Empirical approach
  - Panel data regression + propensity score matching

Native communities in Peruvian Amazon titled 1996-2005



Effect of titling, by year after award



Goal: an web-accessible evaluation "tool kit"

- What?
  - Relational plot-level data
  - How-to manual
  - Case studies
- Why?
  - Analyses are idiosyncratic
- Highlights
  - Assembled bulk of requisite data, including forest cover change data (currently 200-2012, ultimately 1985-2015)
  - Published "how-to" manual in *Forest Policy and Economics*
  - Identified potential evaluation case studies
    - Forest Stewardship Council certification (Regional)
    - Protected areas (Regional)
    - Rio Platano Biosphere Reserve (Honduras)

Targeting tool

Rationale

- Question
  - Where should forest conservation policies (protected areas, PES, etc.) be sited to get the greatest conservation "bang for the buck"?
- Goal
  - A web-based, user-friendly computational tool with on-board data
- Highlights
  - Developed beta-version of tool for Mesoamerica
    - Mexico: best data
    - Central America & DR: placeholder data
  - Used to support USAID MREDD project
  - Draft of academic paper describing the model

Spatial unit of analysis

- Flexible
    - Forest management unit (FMU)
    - 1 km square cell

For each unit, estimate expected benefit per $

- Deforestation risk
- Ecological benefits provided by forest (3)
    - Carbon sequestration
    - Biodiversity habitat
    - Hydrological services
- Cost of conservation

Value added

- Compile rich geospatial data on deforestation risk, conservation benefits and costs
- Aggregate in simple, transparent, conceptually sound fashion
- Provide user-friendly interface

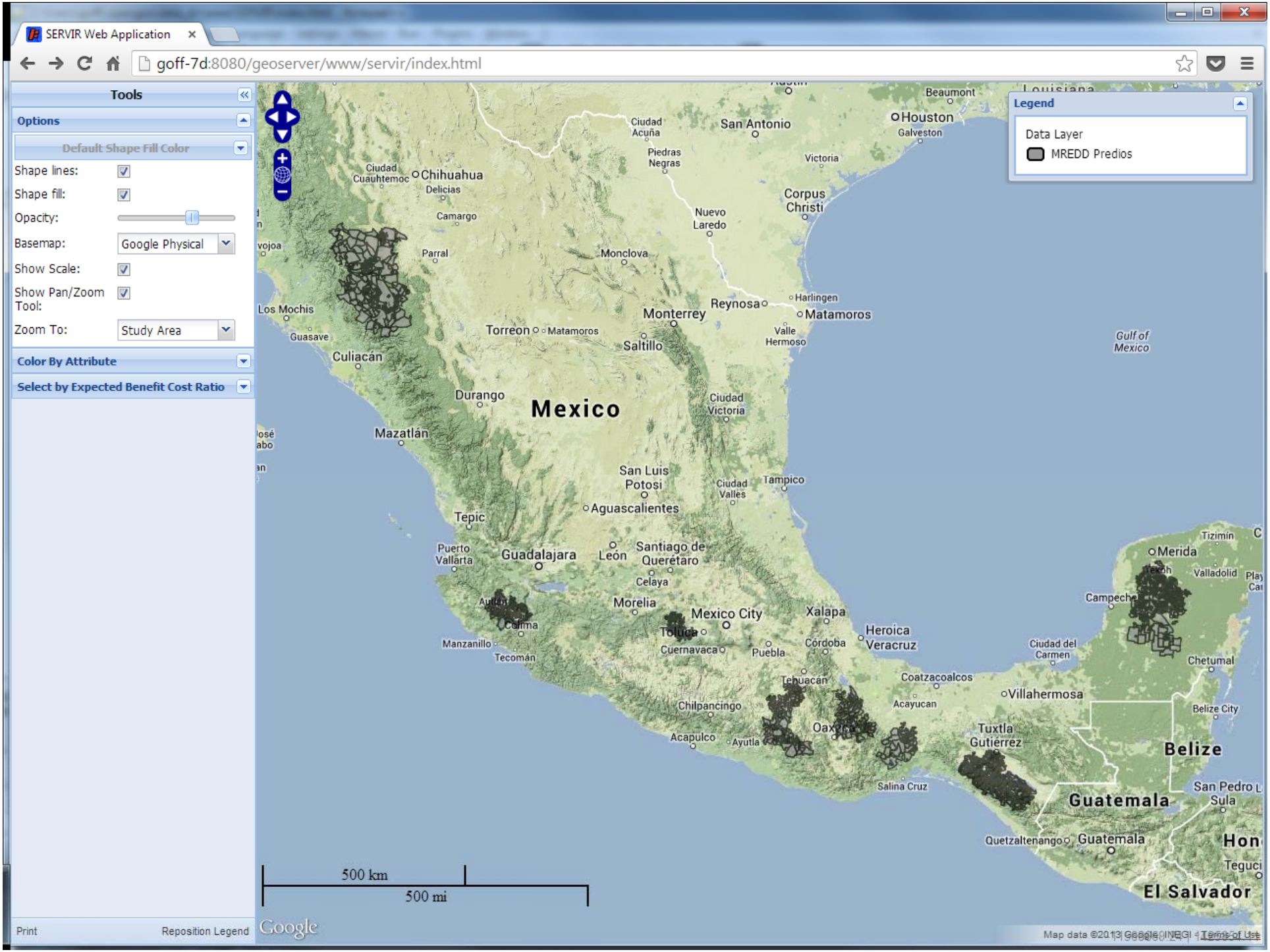
Data (Mexico model)

- Deforestation risk (R)
  - Econometric estimates that capture historical relationship between forest cover change (FCC) and land characteristics
  - FCC data: 2000-2012 Landsat-scale data
- Carbon sequestration (B_1)
  - Woods Hole Research Center Landsat-scale data on above- and below-ground carbon
- Biodiversity conservation (B_2)
  - Count of threatened species (mammals, reptiles, amphibians, birds) derived from species ranges compiled by IUCN and BirdLife International

Data (cont'd)

- Hydrological services (B_3)
  - Watershed-level estimates of forest hydrological services from *Waterworld*, an off-the-shelf model of the relationship between forest cover and hydrological services (Mulligan and Burke 2005)
  - Index: Weighted average of changes in water balance (precipitation-transpiration) and water quality
- Conservation costs (C)
  - FMU-level agricultural opportunity costs, a land-weighted average of gross revenues from crops and pasture

DEMONSTRATION


SERVIR Web Application
goff-7d:8080/geoserver/www/servir/index.html
Tools
Options
Default Shape Fill Color
Shape lines:
Shape fill:
Opacity:
Basemap:
Google Physical
Show Scale:
Show Pan/Zoom Tool:
Zoom To:
Study Area
Color By Attribute
Select by Expected Benefit Cost Ratio
Print
Reposition Legend
Legend
Data Layer
MREDD Predios
Mexico
Gulf of Mexico
Monterrey
Guadalajara
Mexico City
Belize
Guatemala
El Salvador
500 km
500 mi
Google

Thank you!