Food and fuel security adjacent to Udzungwa Mountains National Park, Tanzania: Student learning and research outcomes

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and numerous students who will be identified as their work shows up…

Presentation Overview

- Origin of study-research program
- Udzungwa Mountains National Park
  - Location, brief history and conservation issues
  - Key challenges for park and neighboring villages
- Socioeconomic conditions near the park
  - Economic systems and resource demands
  - Addressing human challenges near the park
- Design and development options
- Learning and research synergies
- Discussion

Origin of program

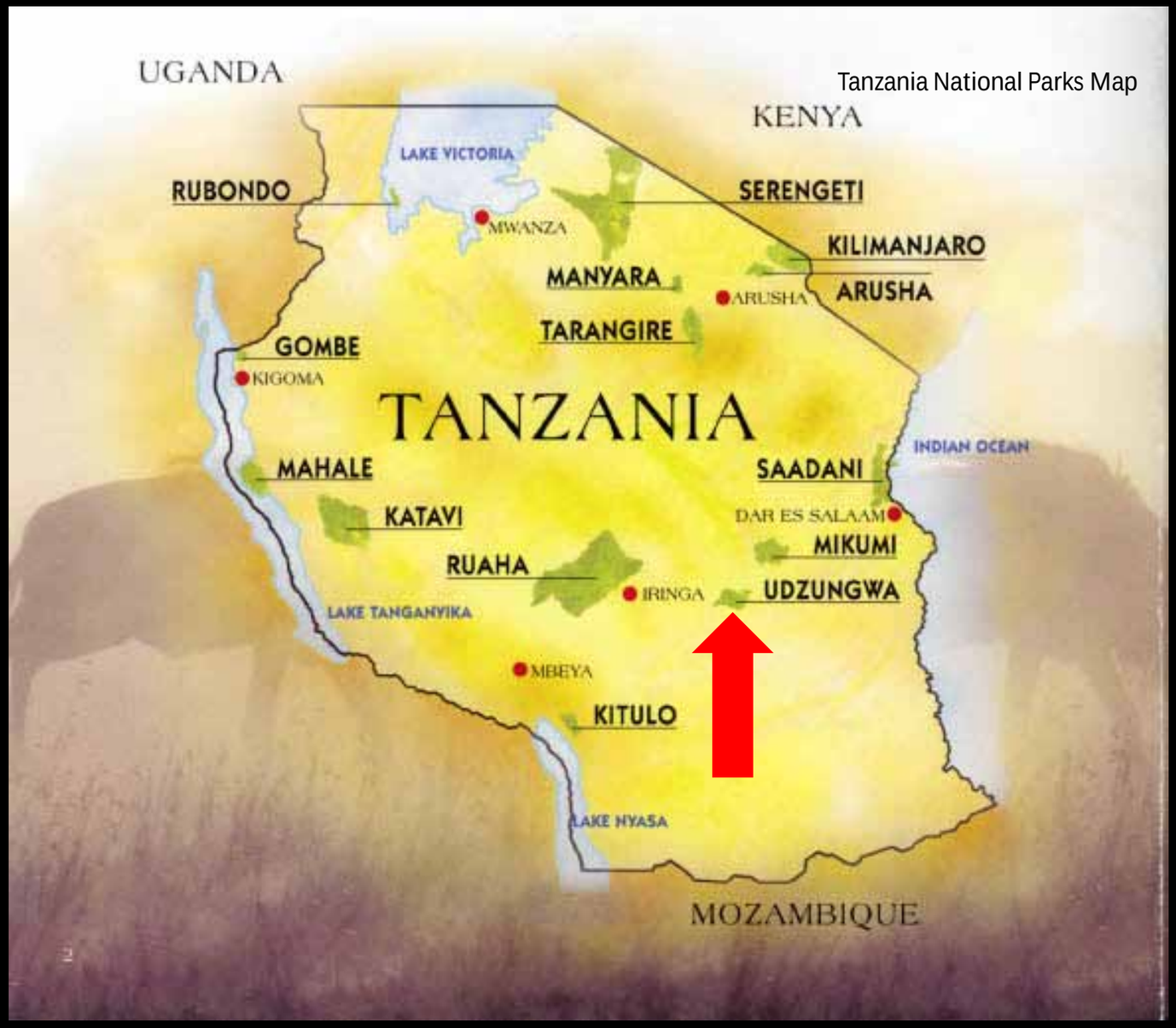
- Desire to conduct study abroad in immersive developing world setting
- Strong research interest in the benefits that community design may offer for conservation
- Issues:
  - Identify a research focus able to sustain long-term faculty attention
  - Identify educational issues of broad interest
  - Identify locations where safety and logistical issues would not consume all our energy

Contacts, support network

- Conservation International/TEAM-Tropical Ecology Assessment and Monitoring Network
- Udzungwa Ecological Monitoring Centre/Trento Museum of Natural Science
- TANAPA-Tanzania National Parks
- University of Dar es Salaam, Department of Wildlife Conservation
- Sokoine Agricultural University
- WWF—World Wide Fund for Nature

Location of UMNP in Africa

- Tanzania in Africa
- Udzungwa Mountains National Park in TZ



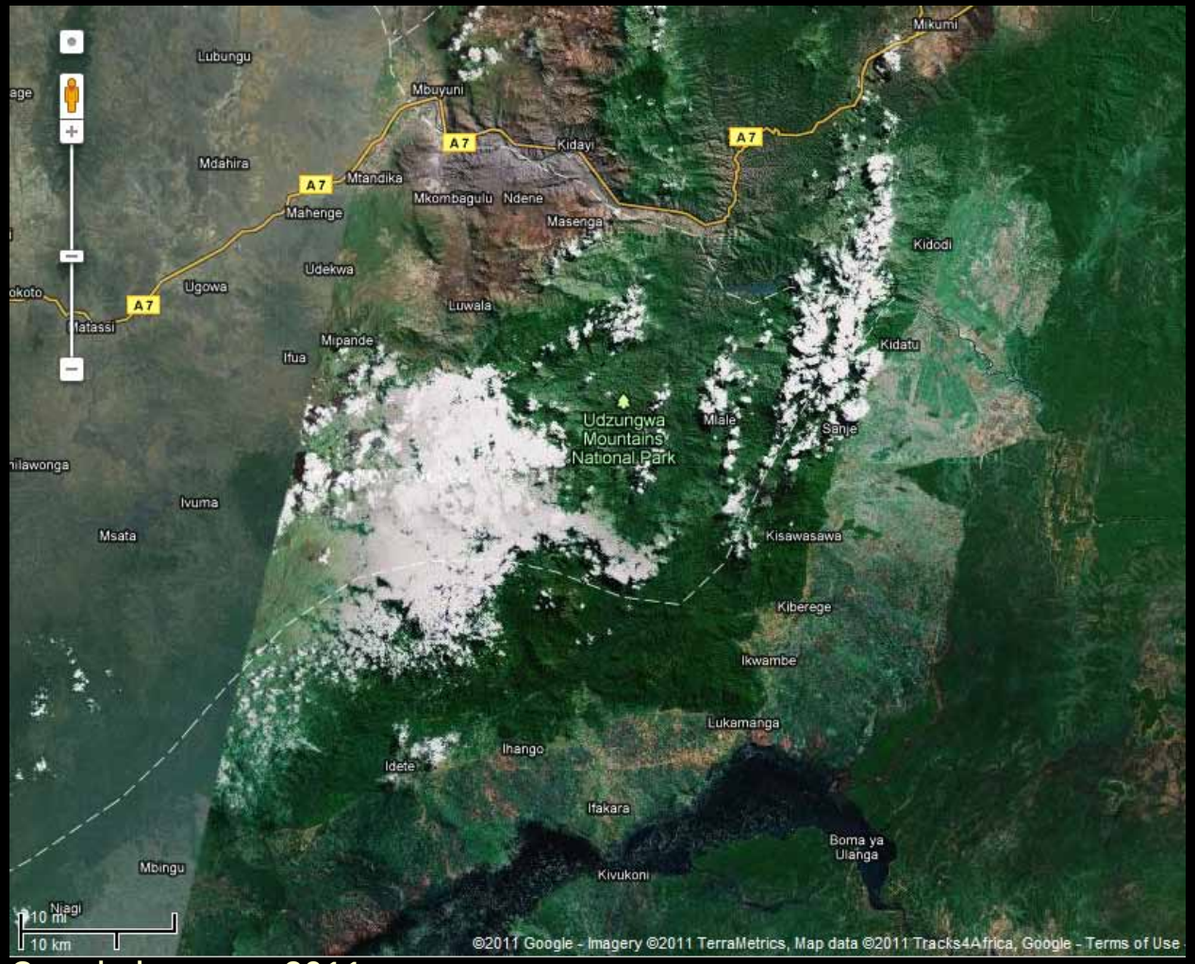
UMNP background information

- UMNP Gazetted in 1992
  - Proposed and backed by World Wide Fund for Nature for value to biodiversity conservation
  - Formed from five 1950s forest reserves
  - Only national park in Eastern Arc Mountains
- Remarkable levels of biodiversity
  - Thirteen species of primates, several endemic
  - 2,500 plant species; 250 species of birds; 250 species of butterflies; high endemism
  - Unknown, but likely very high, fresh water biodiversity; others?
  - Most of the charismatic megafauna

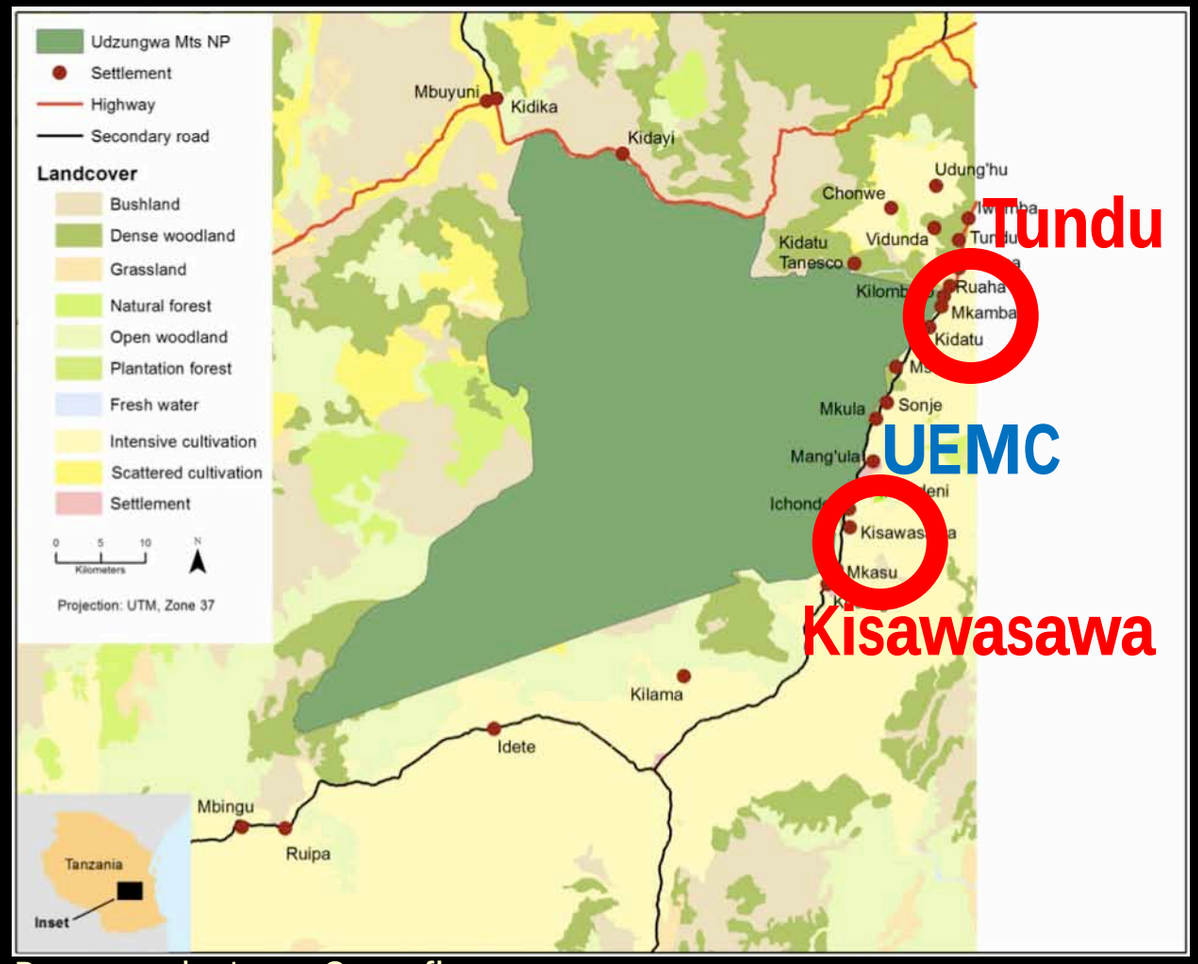
Udzungwa Mountains National Park

The Park in its context

- The mountainous park adjoins the Kilombero Valley—rich in resources—good soils, reliable rain and rivers, forests and woodlands



Google imagery, 2011

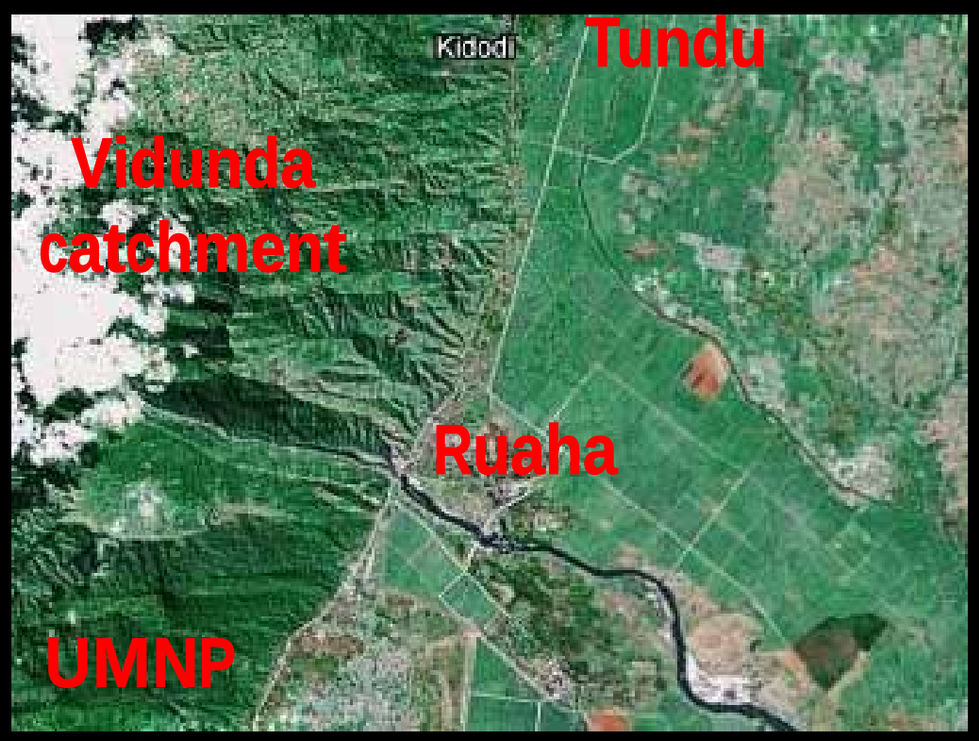


Base map by Larry Gorenflo

Water, food and fuel security

- Water catchment is vital to commercial agriculture and domestic water, but north of the park and Ruaha River is badly degraded
- To maximize sugar mill capacity, outgrower production must increase by 100%, diverting more village land from subsistence gardens
- Set-aside areas for fuel-wood growing have not been effective as long as gathering of fuel in UMNP and forest preserves has persisted
- Fuel-wood gathering ban in UMNP July 1, 2011

Park, road, fields, village, firewood



Google imagery, 2011

Modest villages, scarce resources

2010 season—Tundu village

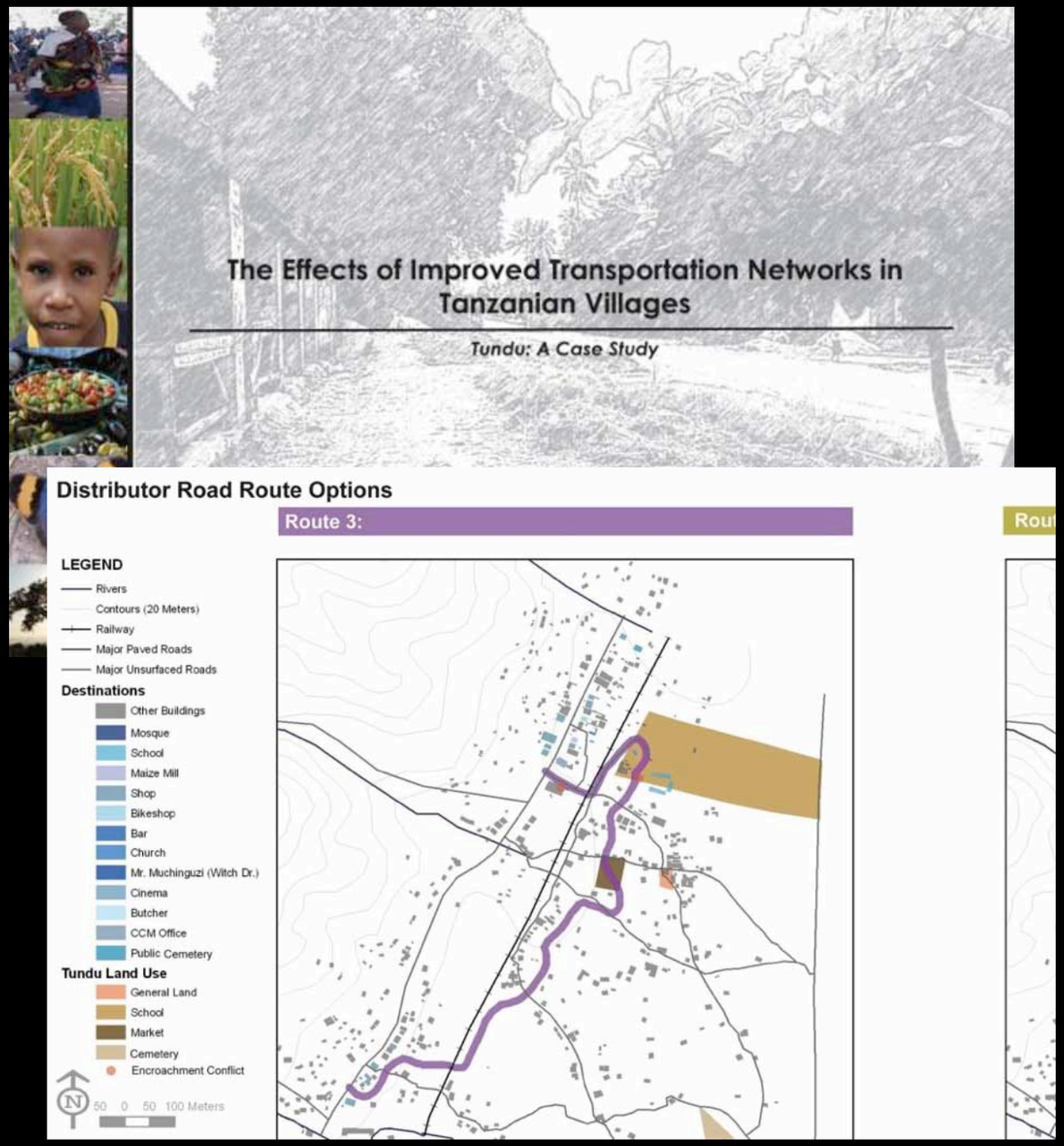
- North of UMNP, +/- 4,000 population
- Bounded on East by sugar plantation of multinational Illovo sugar company
- Once-forested steep hillsides to West comprise Vidunda water catchment, now heavily impacted by deforestation.
- WWF land use plan designates broad areas for watershed protection, village fuelwood harvesting and for forest preserves

Mapping precedes village plans

- With increasing population and growing needs, efficient use of land will be critical
- Land must be reserved for fuel and food production vs. conversion to cash crops
- Location of homes relative to water, woodlots and agricultural fields central to villagers' energy and time budgets
- Standing water, seasonal flooding, location of latrines—represent potential health hazards
- No suitable plans, maps or imaging available

Tundu survey—GPS, tape, compass

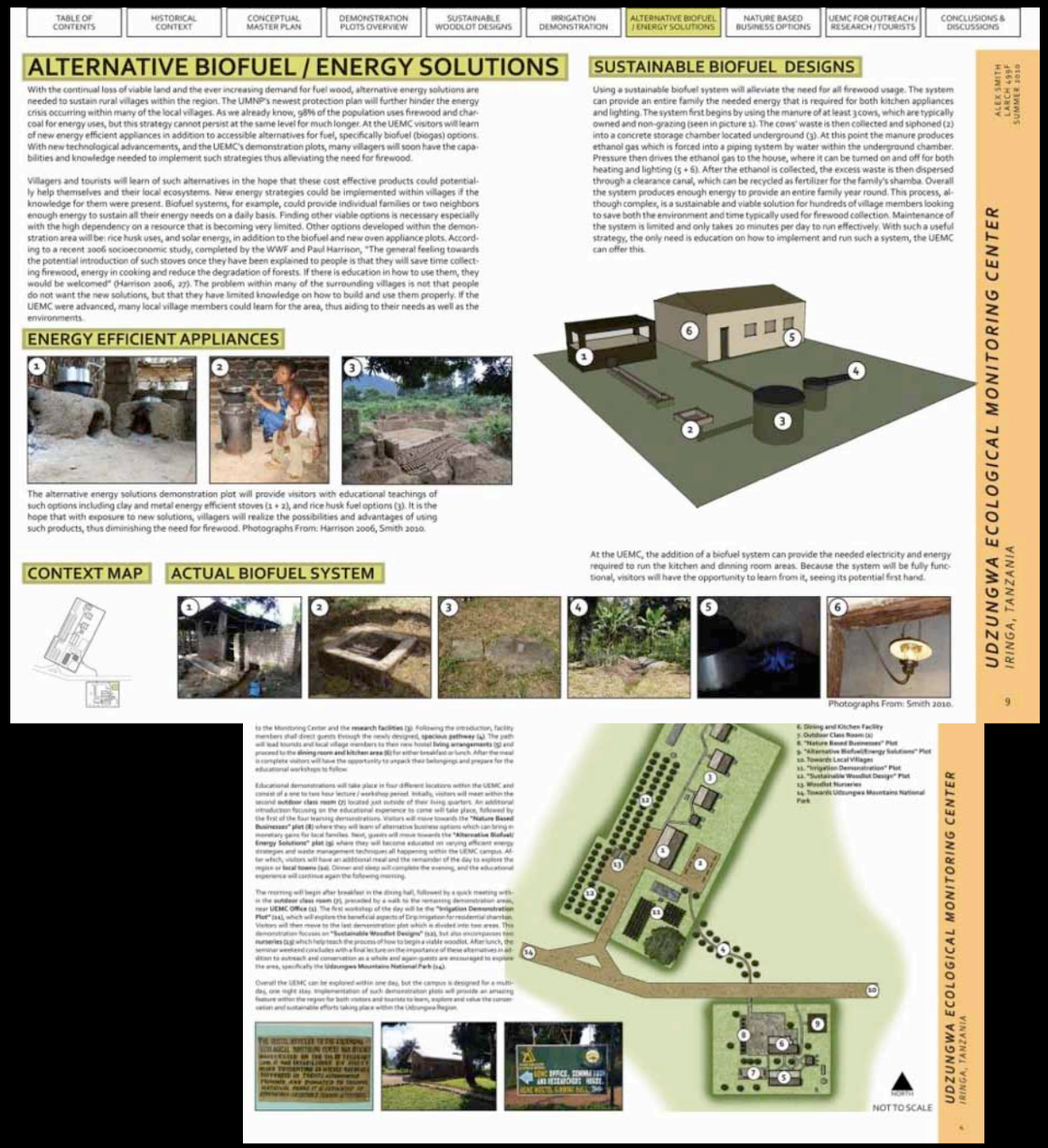
2010 Student projects



How do you insert new roads into an informal village plan?

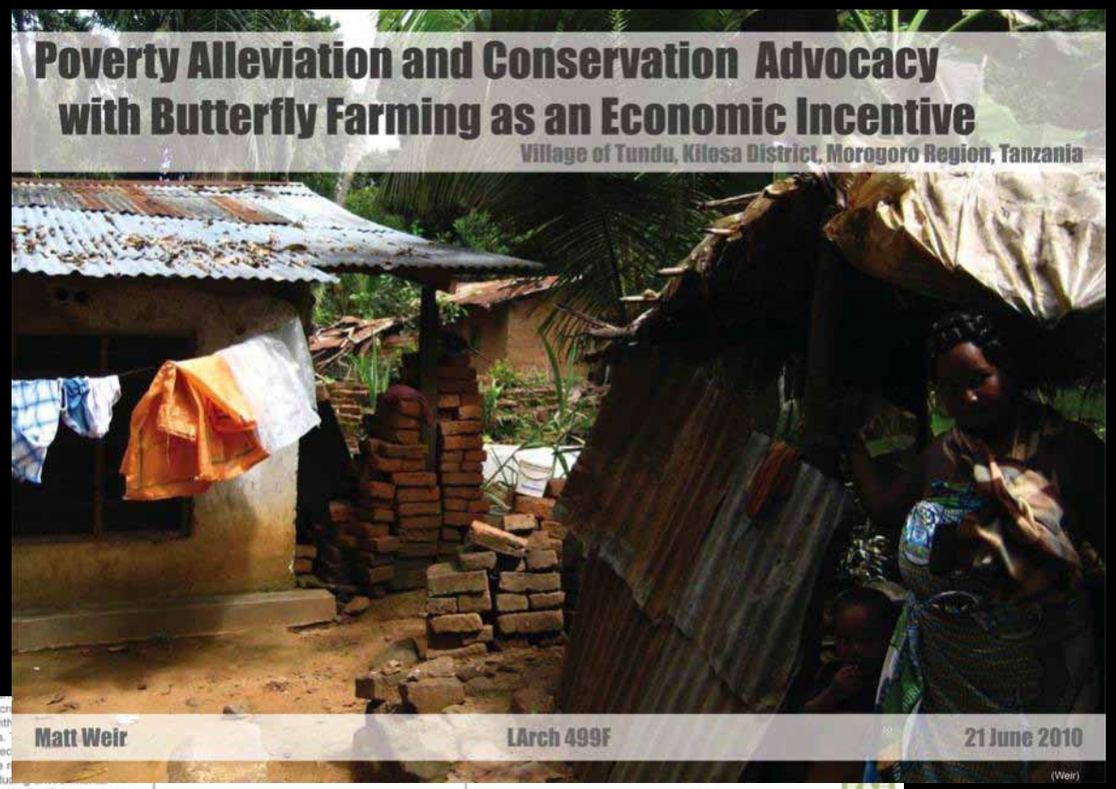
Adrienne Angelucci+ Abigail Thomas, Landscape Architecture students

Udzungwa Ecological Monitoring Centre as a showcase for innovation



Alex Smith, Landscape Architecture student

2010 Student projects



Butterfly farming for poverty alleviation

Matthew Weir, Landscape Architecture student

How can the Park website connect with adventure-oriented tourists?

Rachel Tsupros, Marketing + Gichuhi Kamau, Communications

Key issues

- Agriculture supports food needs for all, some income for 97%; 77% gain income from small businesses; 48% from animal husbandry
- Heavy reliance on deadwood from the park
  - Cooking; trading; brewing; brick-making
  - Alternatives have not caught on—resisted by tradition + poverty
  - Tree planting has not been successful—as long as park has been available as a free resource
- Lack of clarity on land tenure issues and no community-based land use planning

Key resources

- Nyundo, Mtui, Kissaka, 2006
  "Assessment of Ecological and Social-Economic Impacts Caused by Collection of Deadwood, Medicinal Plants and Cutting of Grass for Thatching" for Tanzania National Parks
- Harrison/Kilimanyika, 2006
  "Socio-Economic Baseline Survey of Villages Adjacent to the Vidunda Catchment Area"

2011: Goals for study

- Refine work at Tundu using more concrete base data
- Add a village immediately adjacent to UMNP and closer to Monitoring Centre base
- Critical issues demanding responses:
  - Proposed ban on firewood collecting in UMNP to take effect July 1, 2011.
  - Increasing demand for outgrower sugar production in the Kilombero Valley.
  - Population growth driven by continuing in-migration to work in sugar cane etc.

Our role...

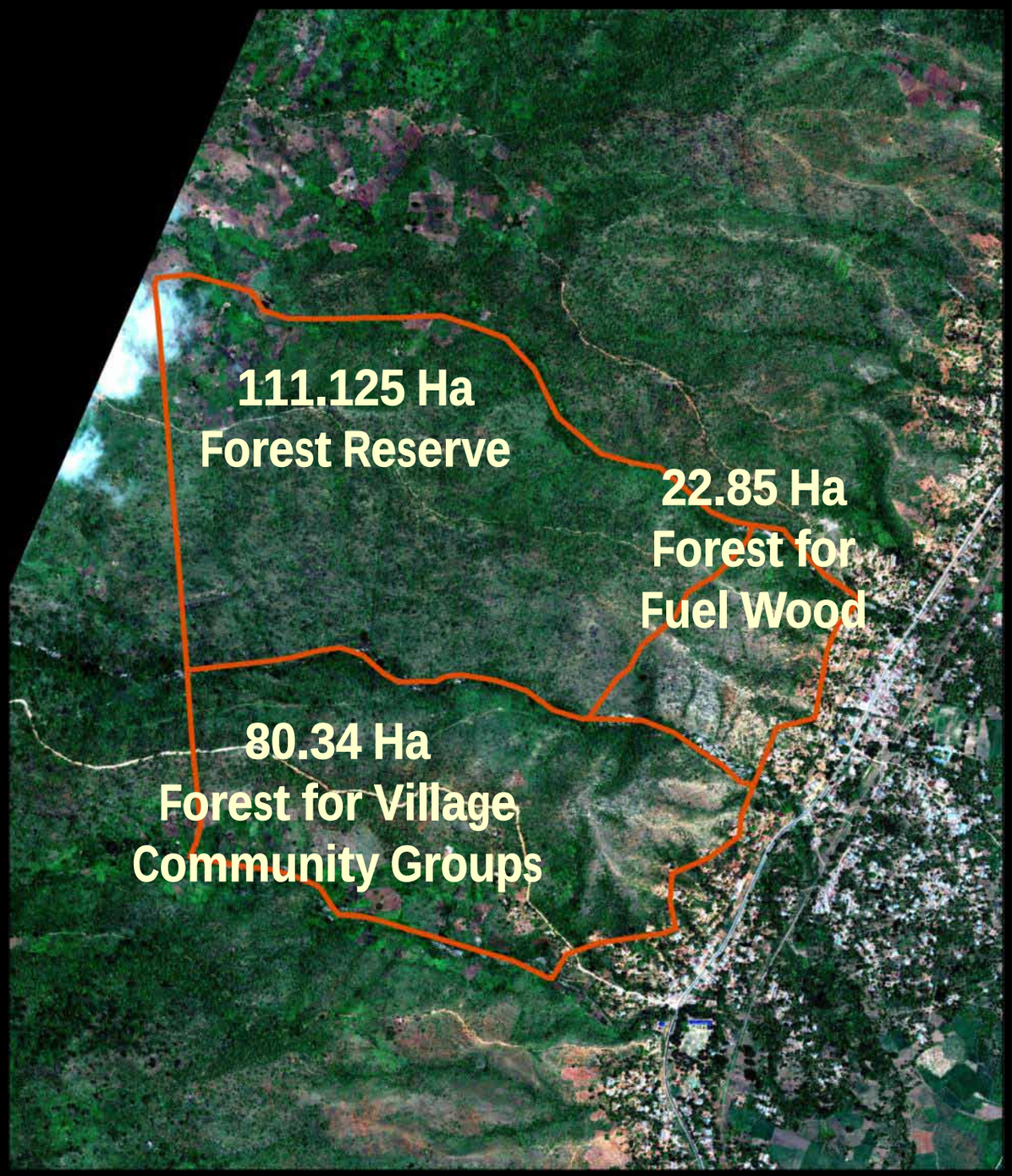
- Past reports highlight resource utilization needs and identify potential short-falls
- But few of them ask whether or how the existing village lands can sustain current or future demands
- Simple questions:
  - Is there enough land to sustain fuelwood needs?
  - Can rice husks, other fuels and erergy-saving stoves off-set fuelwood needs?
  - Is there enough land to accommodate new people and still grow food, fuel and cash crops?

Collecting map data

- Year 2: Georeferenced satellite imagery
  - GeoEye sub-meter satellite imagery indicates majority of village infrastructure and properties
  - Using printouts, visually ID and classify structures—residential, shop, store, latrine, etc.

Maps, Abigail Thomas, Landscape Architecture Student

Tundu – WWF land use plan



- Fuel wood reserve
  - Estimate fuelwood volume per hectare from stem counts

Maps and Data, Melissa Harkavy + David Thompson, Geography Students; Theo Thwing, Landscape Architecture student

Tundu – WWF land use plan

- Energy usage
  - Estimate wood used for domestic fuel, brewing, brick-making

Maps and Data, Melissa Harkavy + David Thompson, Geography Students

Tundu – WWF land use plan

- Existing rice paddy
  - Estimate rice husk energy potential available for fuel

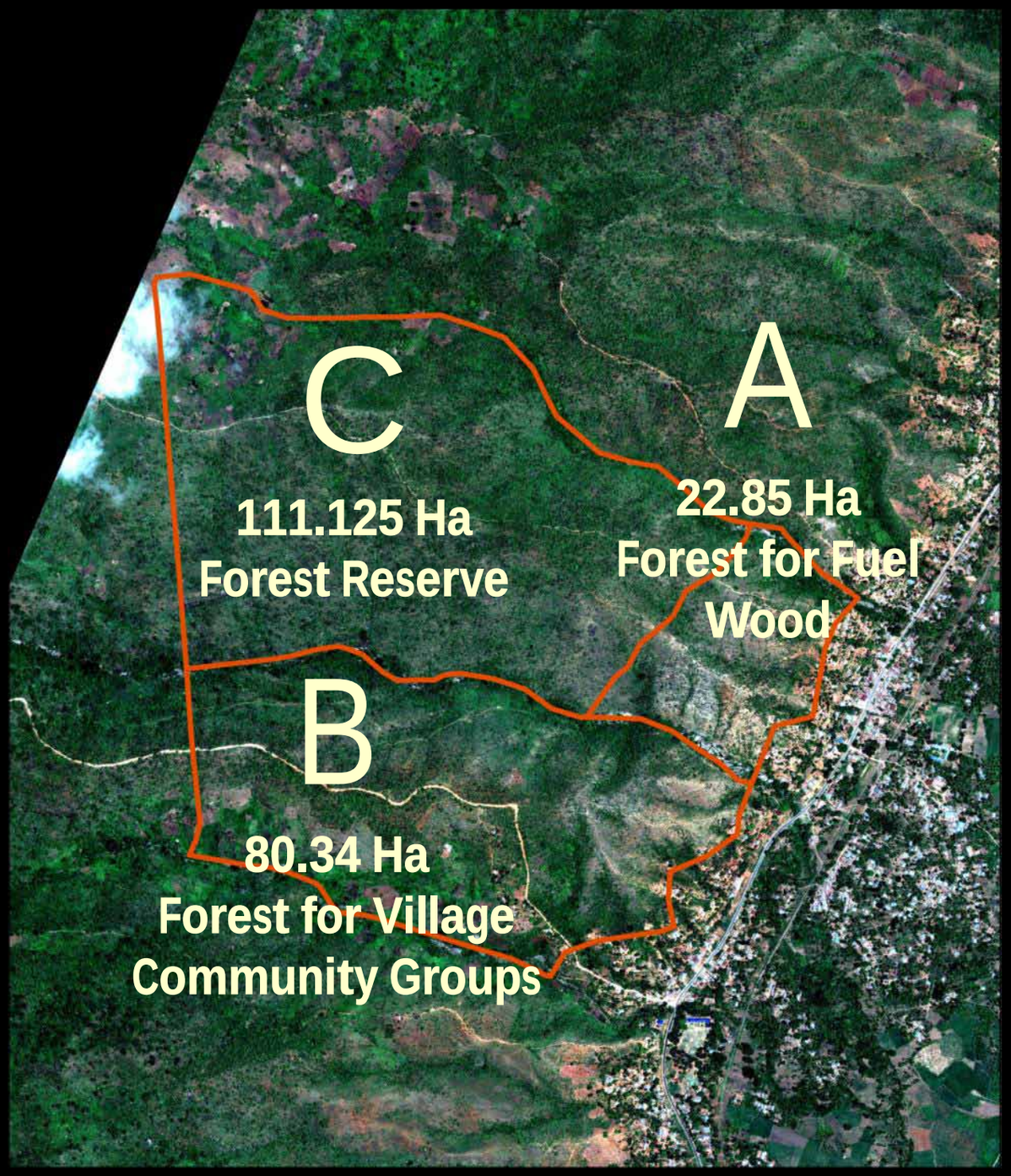
Maps and Data, Melissa Harkavy + David Thompson, Geography Students

Tundu – WWF land use plan

- Efficiency and alternatives
  - Factor-in fuel-efficient stoves, biogas, charcoal

Maps and Data, Melissa Harkavy + David Thompson, Geography Students

Tundu – Sustainability



Maps and Data, Melissa Harkavy + David Thompson, Geography Students

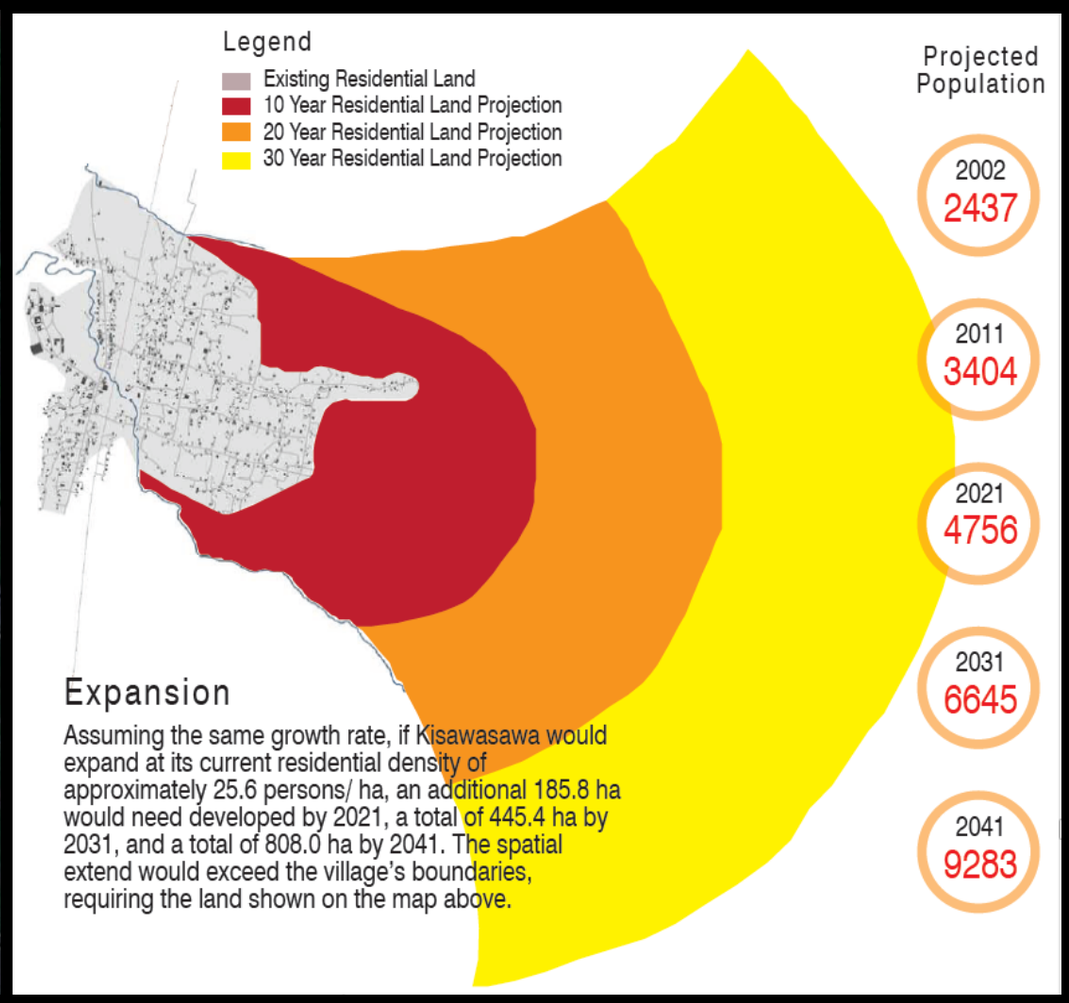
- 20-year projection
  - Fuelwood reserve A supports current use < 2 years
  - Only a mixed fuel scenario, with efficient stoves, using all forest areas, A+B+C, has a hope of sustaining anticipated growth

Kisawasawa village—land use

- 35km South of Tundu, +/- 9,000 population.
  - Bounded on East by extensive village-owned rice paddy.
  - Immediately bounded by UMNP to west.
- No plans for watershed protection, nor fuelwood harvesting, nor for protection of village gardens and paddy in face of growth.
  - No WWF land use plan prepared for this location
- Vigorous population growth, finite land resources, loss of UMNP as fuel resource

Kisawasawa

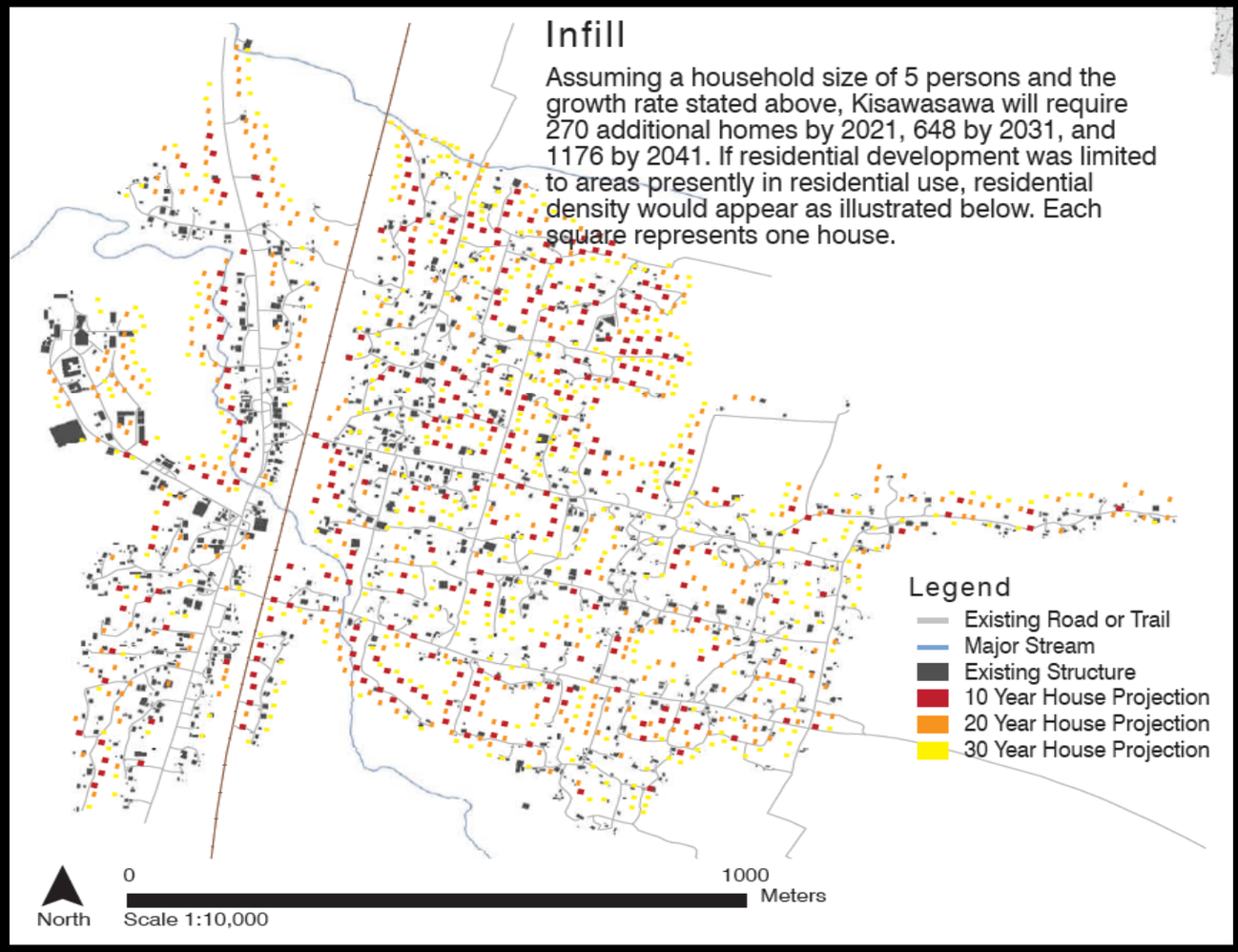
- Effects of population growth
  - Kisawasawa growing at 3.4% annually—10, 20 and 30 year projections at current density
  - Land (fuel and food) resource quickly depleted



Plans and Data, Ariel Ries, Sarah Rumbaugh, Kellie Waksmunski, Landscape Architecture Students

Kisawasawa

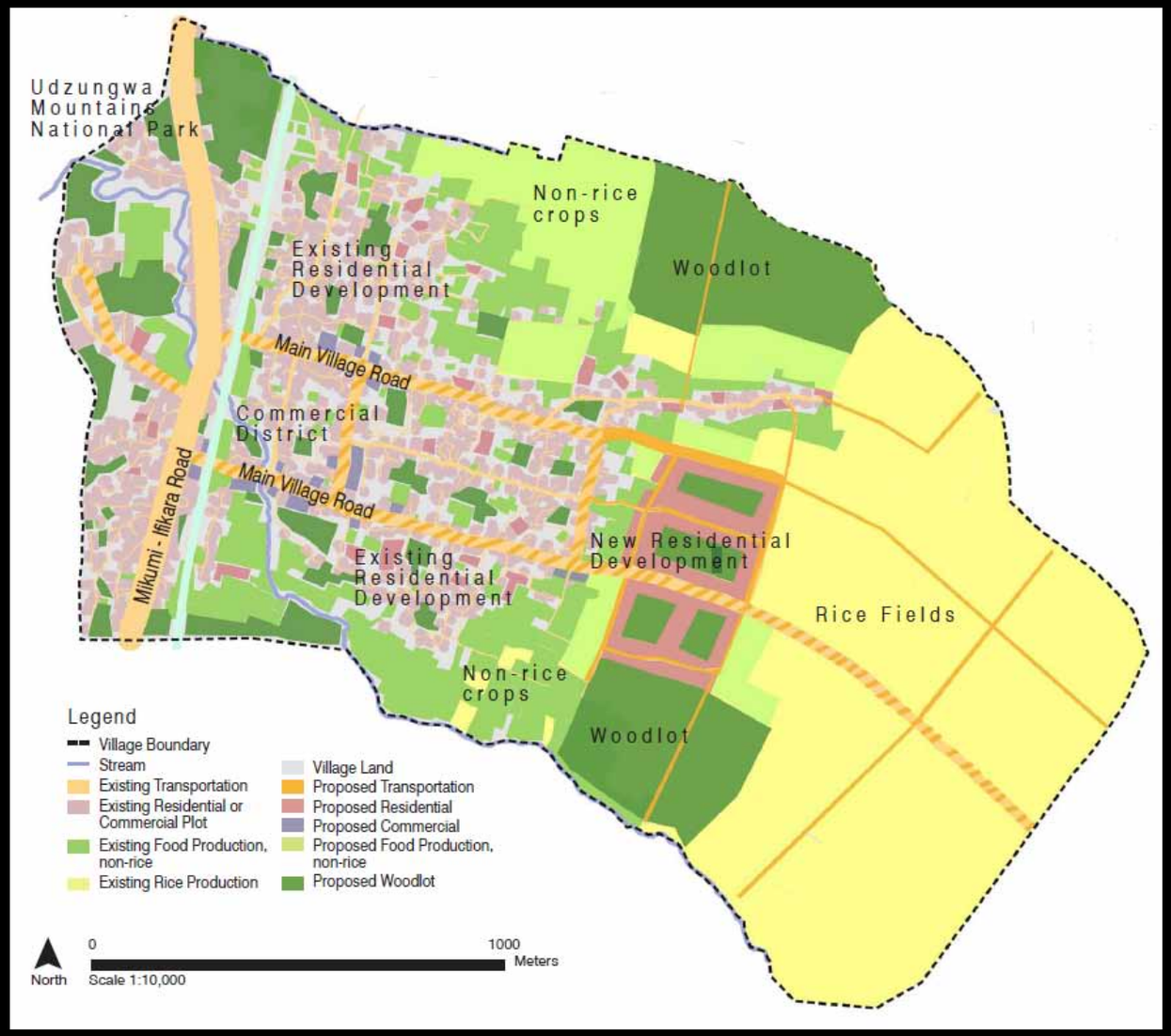
- Sprawl is the current pattern of growth
  - Organizing around grid layout enables infill without sacrificing space for shambas (gardens)



Plans and Data, Ariel Ries, Sarah Rumbaugh, Kellie Waksmunski, Landscape Architecture Students

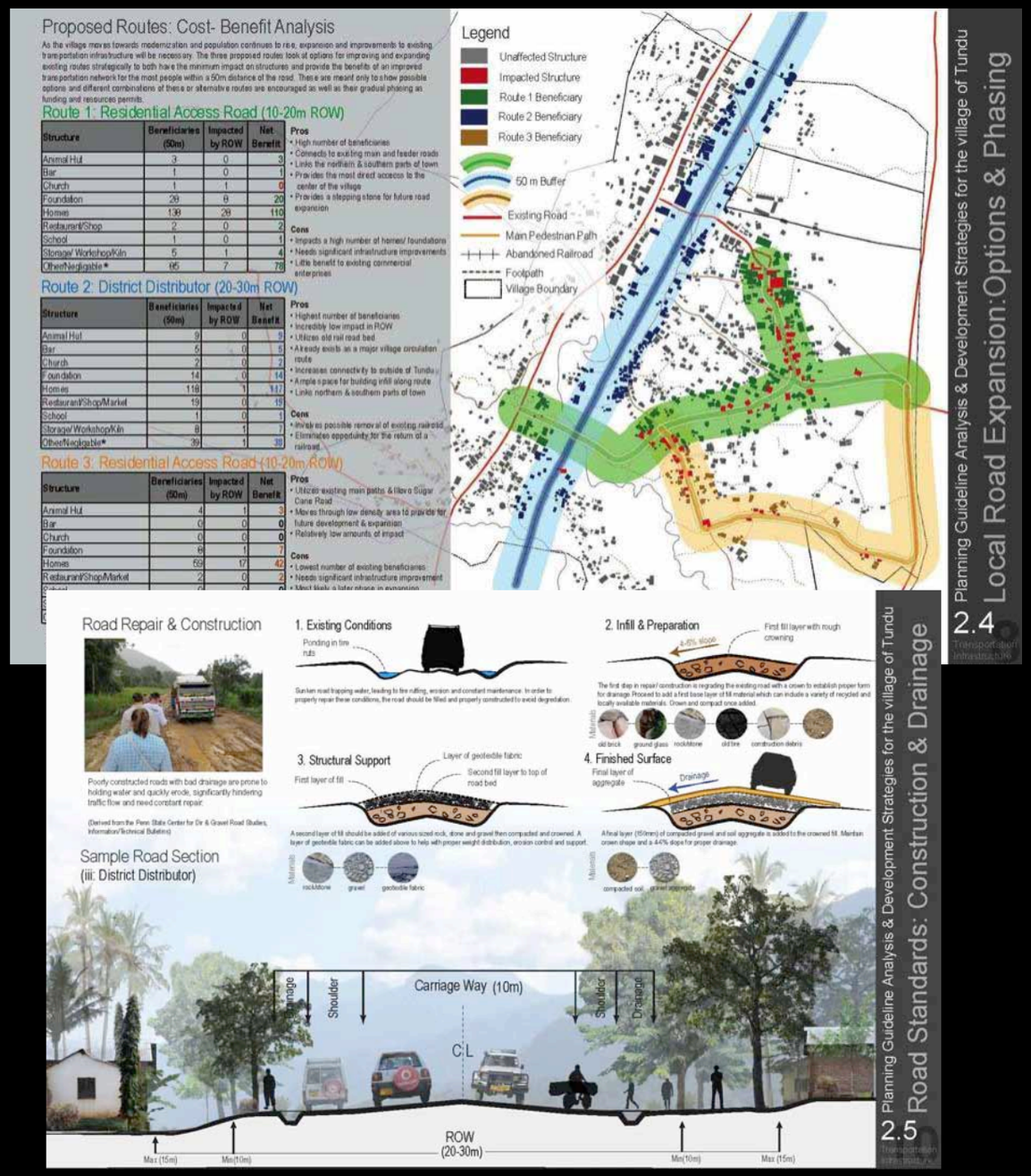
Kisawasawa

- Development plan
  - Maximizes infill to retain space for growing food
  - Balances cash crops against need for subsistence gardens and woodlots
  - Needs new sources of income to remain viable



Plans and Data, Ariel Ries, Sarah Rumbaugh, Kellie Waksmunski, Landscape Architecture Students

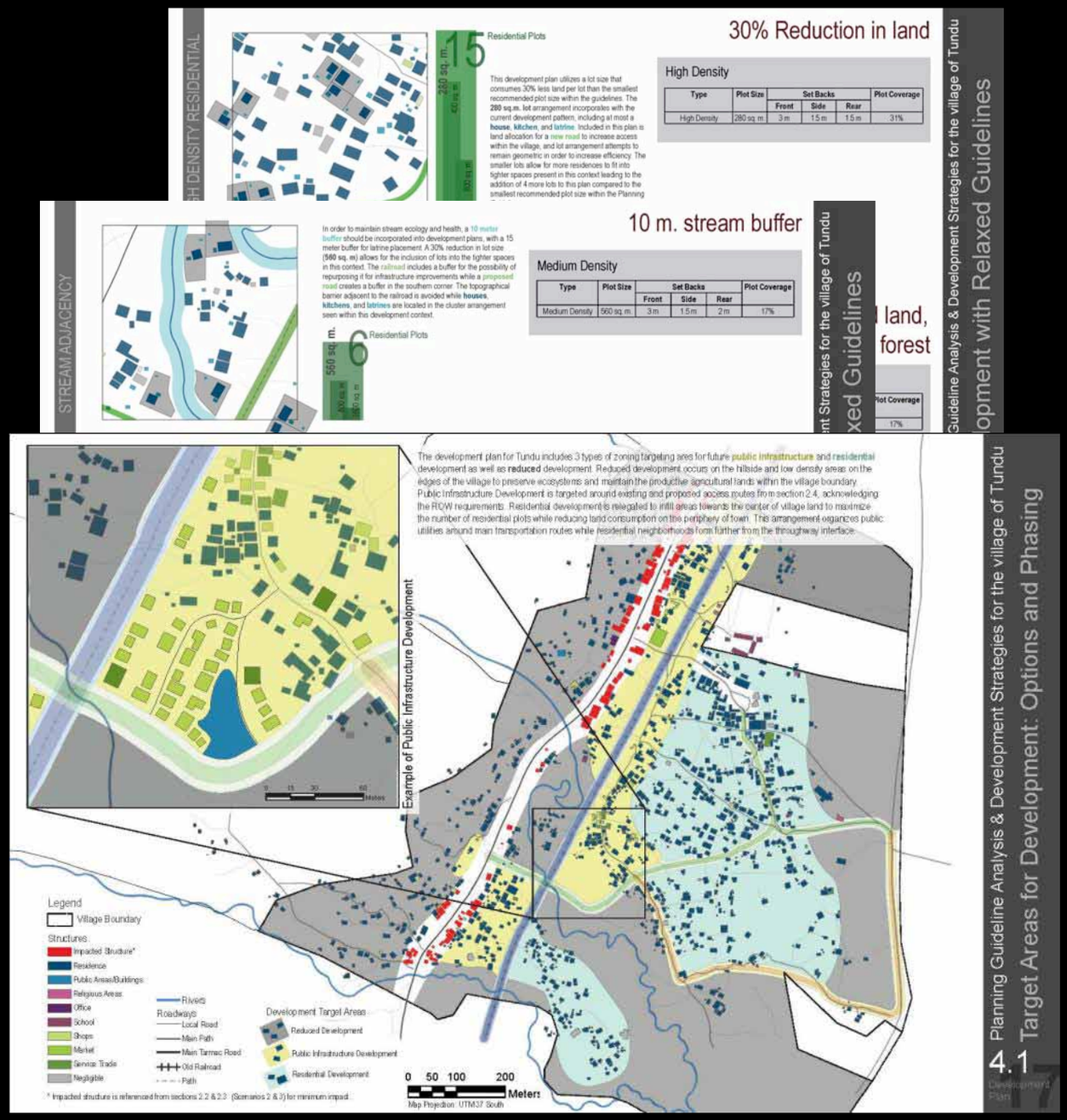
More 2011 Student projects



Infrastructure alternatives for Tundu

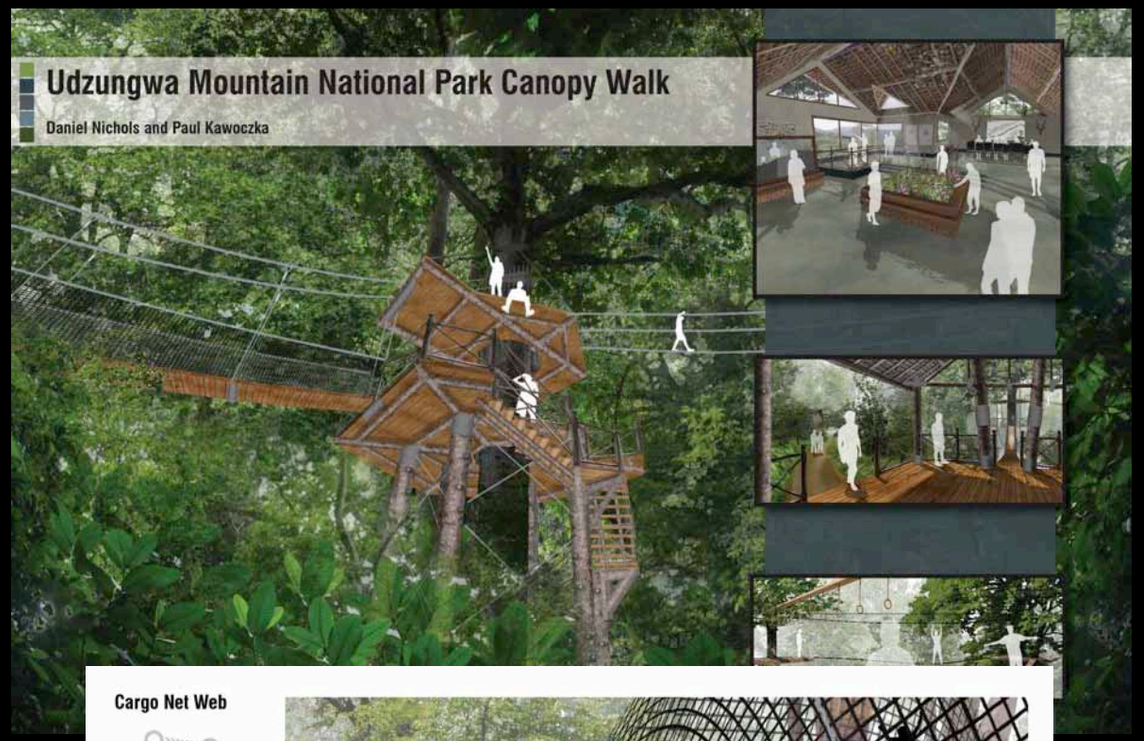
Daniel Sepsy, Landscape Architecture student

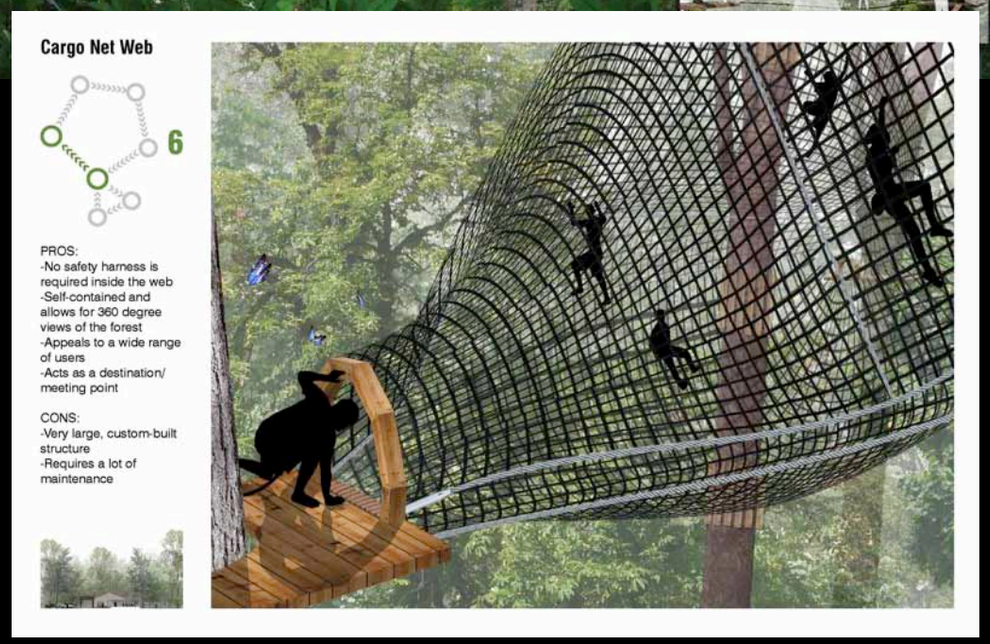
How can Tundu accommodate growth and protect water and land resources?



Gabbi Salvemini, Landscape Architecture student

More 2011 Student projects

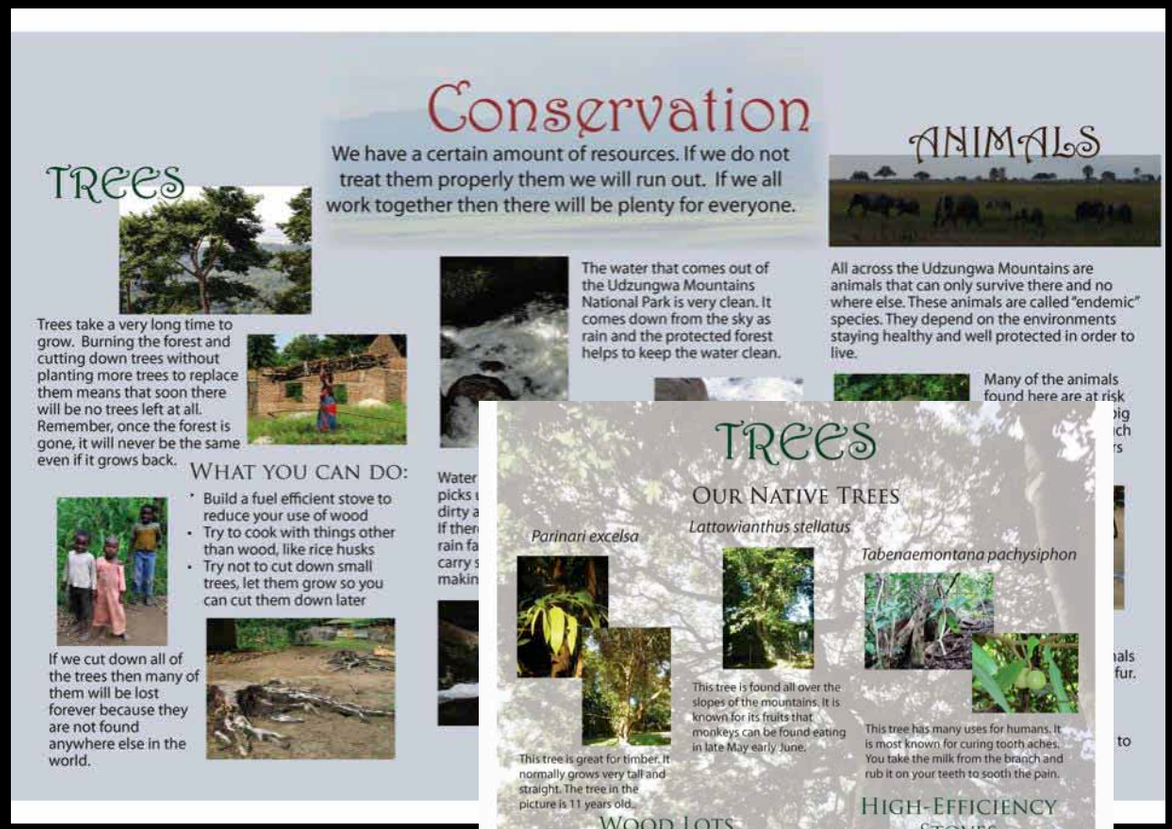




Canopy walk for Udzungwa Mountains National Park

Paul Kawoczka + Dan Nichols, Landscape Architecture student

Educational support materials for schools in the Udzungwa area



Jessica DiMarzio, AgExt Education + Nicole Murray, Public Relations

Parks and People Study Abroad

- Six-week program, mid-May—end June, nine credits, limited to twelve students
  - 3-credit seminar: People and Protected Areas
  - 5-credit studio: Community Design in the Vicinity of UMNP
  - 1-credit colloquium: Service-Learning for Students and Community
- Orientation at University of Dar es Salaam, Sokoine University of Agriculture; four weeks in field; three day safari in Mikumi National Park; three days in Zanzibar

Formal educational experiences

Informal educational experiences

Student reflections

- *“Culture is a dynamic, complex, living entity. It doesn’t pause to be captured in a picture or to be explained to a friend. Before it can be explained it has already moved on. I knew I was going to see and experience new and different cultures while in Tanzania, but I had no idea the effect they would have on me. ”* (2011 participant)
- *“Now I realize that the size of my contribution isn’t the sole indicator of its success. It is more about doing something, because without trying there will never be any growth or progress.”* (2011 participant)

Future

- Continue land-use surveys that communities can use to locate boundaries, establish land tenure, and think about land use zoning
- Continue to assist Tundu and Kisawasawa in developing their alternate future scenarios
- Deploy household income and expenditure survey to fill gaps in socio-economic picture
- Collect field data to refine fuel production and utilization models
- Work with program students to explore new questions, new solutions

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Harrison (2006) – III

- Recommendations and Monitoring steps:
  - Build capacity of village natural resource committees
  - Implement land use planning
  - Broaden environmental education/awareness
  - *Initiate village environmental scouts*
  - Develop village forest reserves.
  - Initiate village and local area tree planting
  - Develop alternative energy sources
  - Develop alternative income generating activities
  - Support community-initiated projects
  - Formulate and enforce land use bylaws

Nyundo et al. (2006) for TANAPA

- "Assessment of Ecological and Social-Economic Impacts Caused by Collection of Deadwood, Medicinal Plants and Cutting of Grass for Thatching" for TANAPA
  - Biological diversity declines with intensive exploitation
  - Heavy reliance on deadwood from the park
    - Cooking and heating; trading; brewing
    - Alternatives have not caught on—tradition + poverty
    - Tree planting not successful—as long as park available
  - Minor impacts from thatch and medicinal plant collecting

Harrison (2006) for WWF

- “Socio-Economic Baseline Survey of Villages Adjacent to the Vidunda Catchment Area”
  - Agriculture supports food needs for all, some income for 97%; 77% gain income from small businesses; 48% from animal husbandry
  - In times of stress—drought, harvest failure—the natural environment, e.g., the Park, is seen as a “safety net” of abundant resources
  - Clarity of land tenure and ownership issues and consistent community-based land use planning have potential to bring improvements in economic and social well-being