EXAMINING LCLUC IN SOUTHERN VIET NAM

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NASA LCLUC Science Team Meeting, April 2019

TEAM

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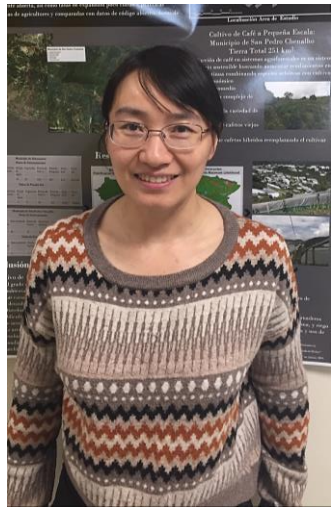

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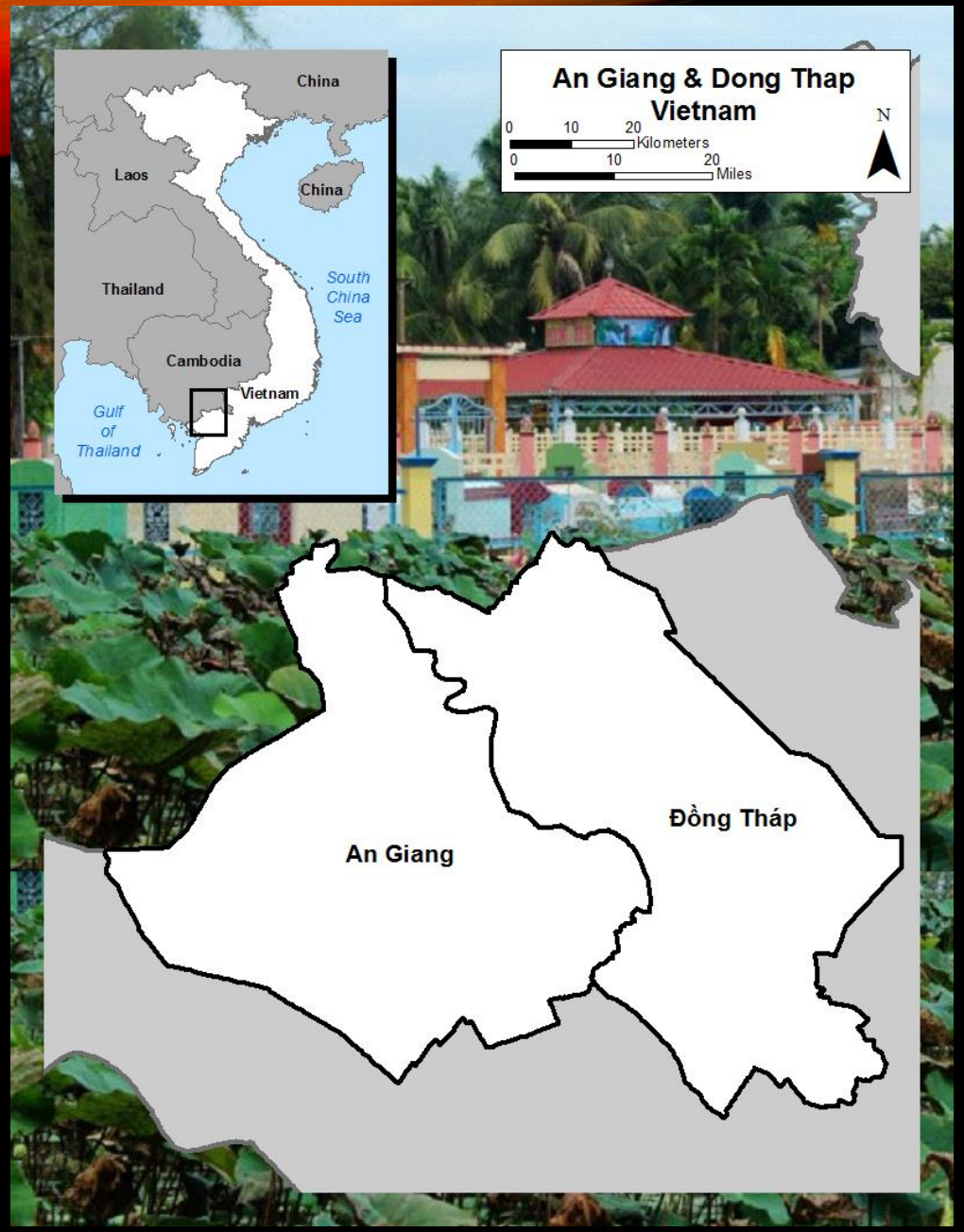


STUDY GOAL

- The *overarching goal* of the proposed project is to **quantify the changes and model the future trajectory of LCLUC.**

- **How?** Incorporating a **sociocultural framework into a spatial modeling environment.**

Hòa Hảo emphasizes the **connection of an individual to the land in a relationship that is intimately ethical, spiritual, and national.**

Founded in 1939 by Buddhist Master Huỳnh Phú Sổ (Phật thầy Huỳnh Phú Sổ).

Focus on acts of piety in one's community and family and **forbids the construction of new temples**, payment for religious ceremonies, or ostentatious displays of religiosity.

PGHH

PHẬT GIÁO HÒA HẢO

HÒA HẢO BUDDHISM

Biết làm sao gieo đạo khắp đại đồng, đưa nhân loại đi vào vòng hạnh phúc.

Huỳnh Phú Sổ **preached a moralistic doctrine which glorified the rice agriculturalist and the simple lives of Vietnamese peasants** and quickly gained adherents throughout the western Mekong Delta.

The Hòa Hảo developed a **religiously inspired militia and engaged actively in anti-colonial resistance and later anti-Communist and anti-American resistance in the 1960s-1970s.**

PGHH

PHẬT GIÁO HÒA HẢO

HÒA HẢO BUDDHISM

Biết làm sao gieo đạo khắp đại đồng, đưa nhân loại đi vào vòng hạnh phúc.

TRAM CHIM NATIONAL PARK

Tràm Chim National Park

Website Directions Save

4.1 ★★★★☆ 1,945 Google reviews

National park in Vietnam

Tràm Chim National Park is a national park in the reed fields Đồng Tháp Mười, Tam Nông District, Đồng Tháp Province of Vietnam. This national park was created to protect several rare birds, especially the sarus crane, a species listed in the IUCN Red List. Wikipedia

Address: Khóm 4, Tam Nông District, Đồng Tháp Province, Vietnam

Area: 29.3 mi²

Province: Đồng Tháp Province

Established: 1998

Phone: +84 277 3827 436

TRAM CHIM NATIONAL PARK

HYPOTHESES

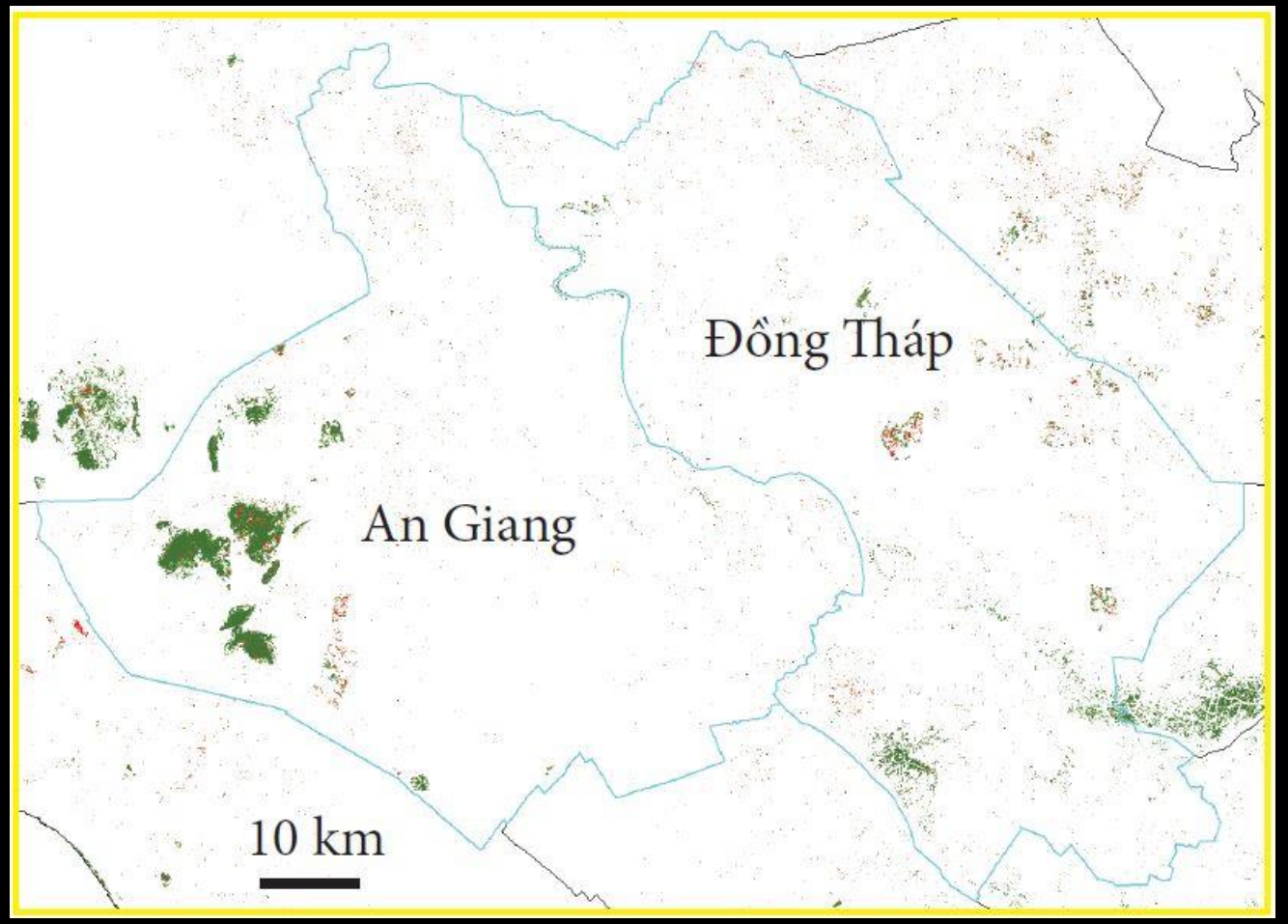
- **Hypothesis 1:** Greater rates of agricultural intensification and expansion will occur in Đồng Tháp and An Giang from 1985-2019 due to the religious influence of the Hòa Hảo.

- **Hypothesis 2:** Urban expansion and fragmentation of built up areas will be less in Đồng Tháp and An Giang due to the religious and cultural values of Hòa Hảo that prohibit the building of new temples and structures.

- **Hypothesis 3:** Volunteered Geographic Information (VGI) crowd sourced from social media will be a better indicator of the local population's perception of LCLUC drivers and pathways for the current and recent past (~2010-2019) in our study region than our in-person interviews with officials and academicians.

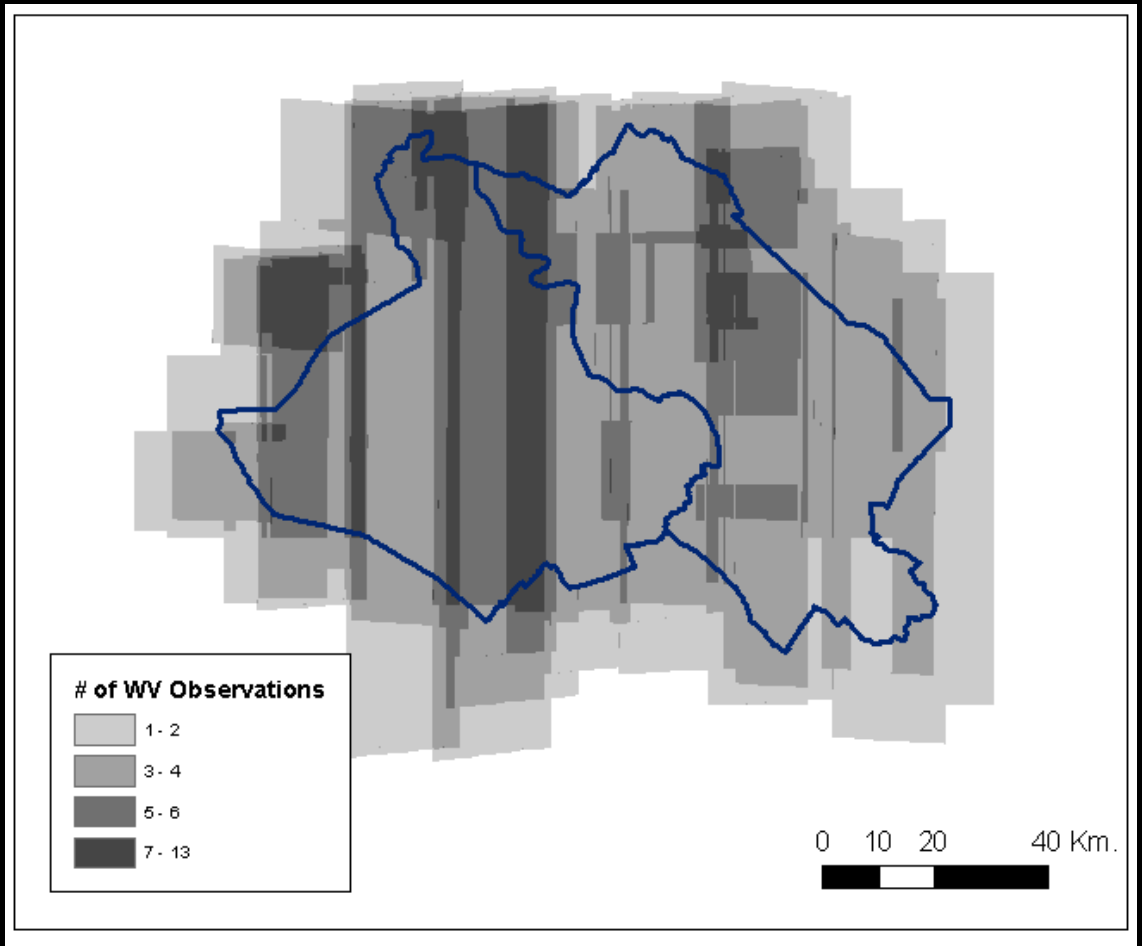
EARTH OBSERVATIONS

- Use multitemporal remote sensing to map **forest, agriculture, and urban change**
- Moderate-scale for circa 1985, 1990, 2000, 2005, 2010, 2015, and 2018-19
- Very high resolution for 2005, 2008, 2010, 2012, 2015, and 2018-19



Landsat-based tree cover loss from 2000 to 2015 (red) compared to year 2000 canopy cover (green).

EARTH OBSERVATIONS



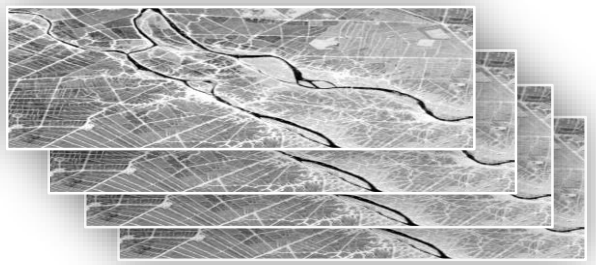
- 2008-2015 panchromatic segmentation of fields using WV from NextView License
- Removed duplicate data: converted 173 individual scenes to 45 strips representing unique observations
- Per-pixel TOA composites to represent large-scale land cover/land use

USING SAR FOR CROPPING INTENSITY

Sentinel-1 SAR: Rice Mapping

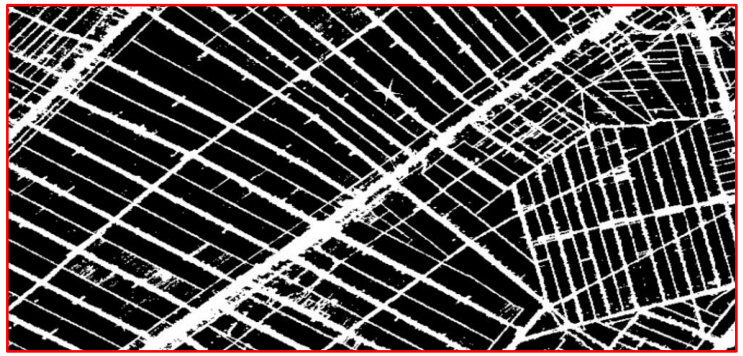
Method

Interferometric Wide Swath Mode (IW) images that were Vertically transmitted Horizontally received (VH) polarization.



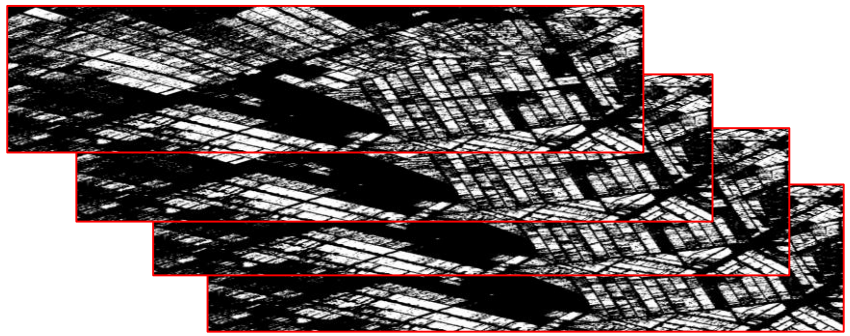
Sentinel-1 VH dB images

Thresholds on an annual sum backscatter image to mask out non-rice pixels



Binary Non-rice mask

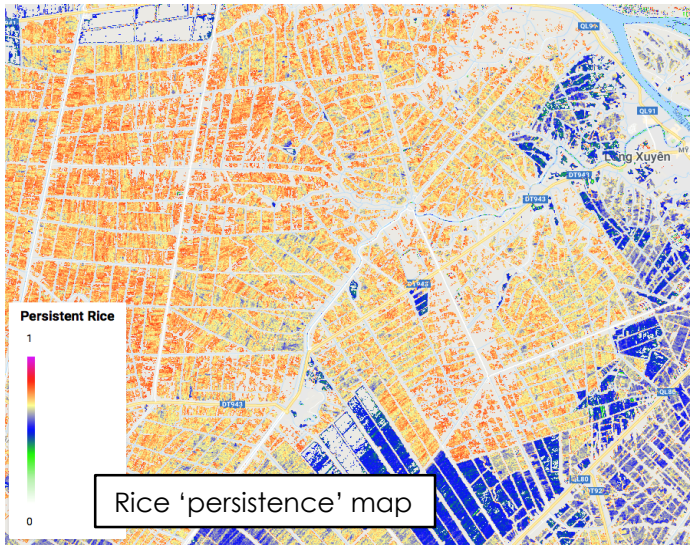
For each image in the annual stack, rice was mapped using thresholds and the presence of the non-rice mask



Rice 'presence' binary maps

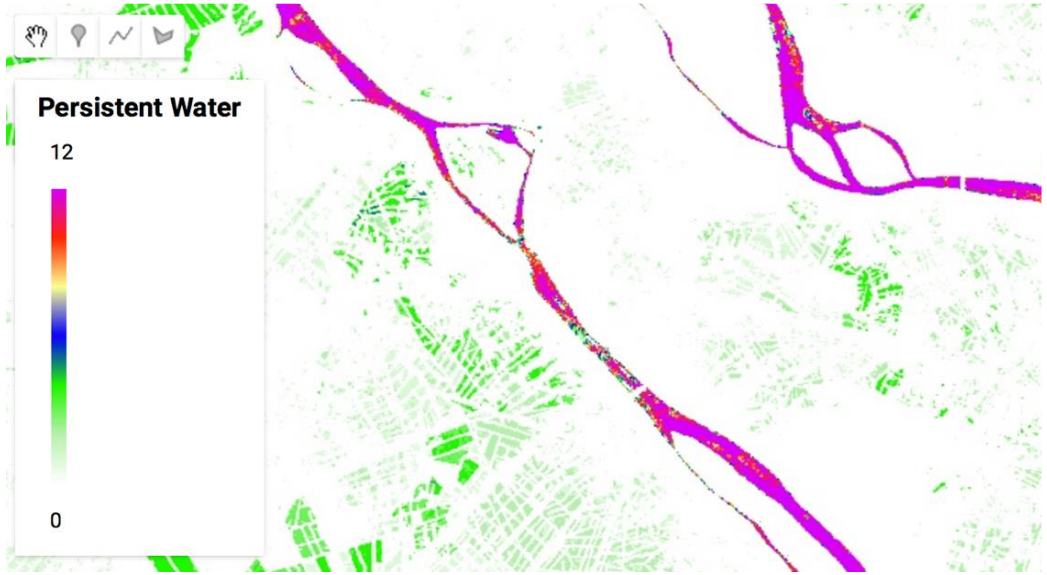
Results

Normalized Rice Persistence: The rice binary maps were summed and divided by number of images in stack, for each pixel generating a normalized measure of 'rice persistence'.

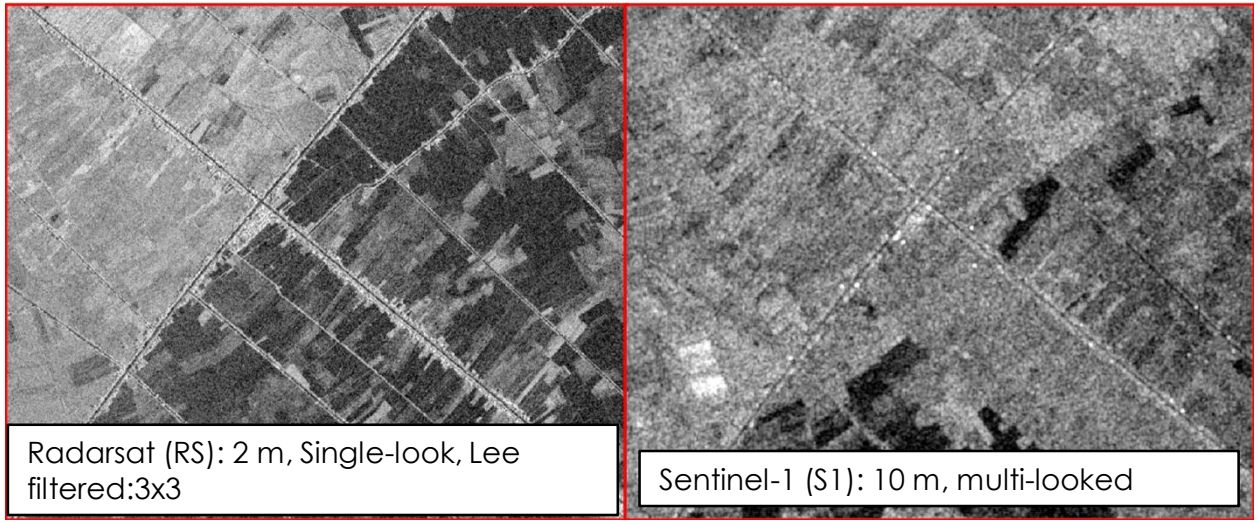


Rice 'persistence' map

Normalized Water Persistence: An inverse method to rice mapping also enables a normalized water persistence image to be generated



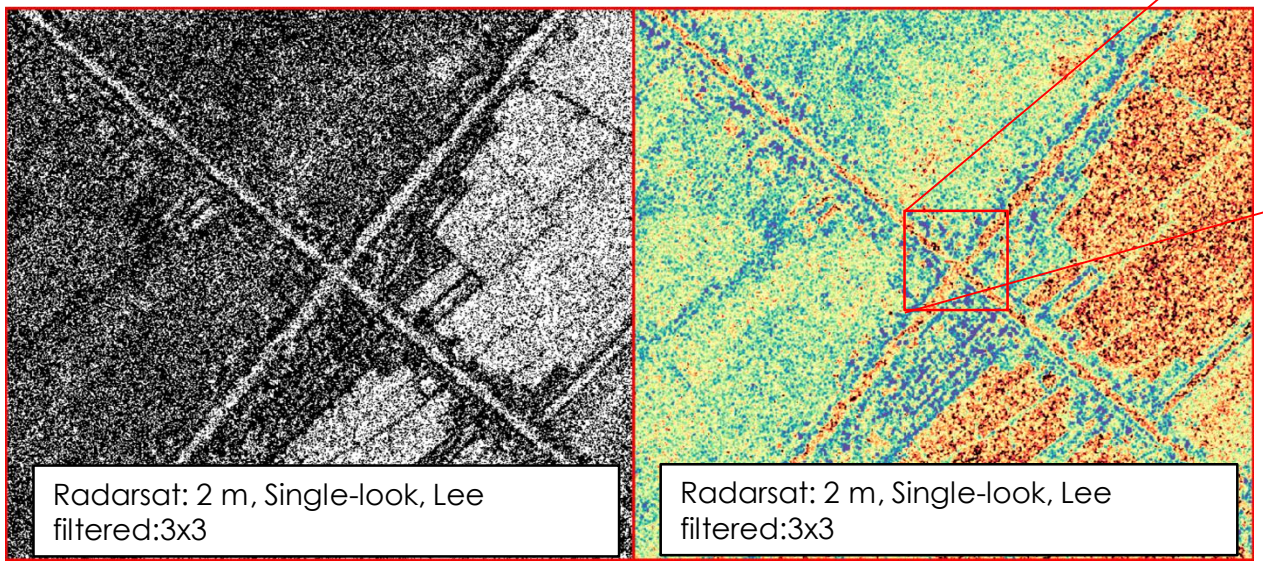
Radarsat



Radarsat (RS): 2 m, Single-look, Lee filtered:3x3

Sentinel-1 (S1): 10 m, multi-looked

Differences in the resolution of RS (left) and S1 (right) are clear, with the RS2 appearing to be a much 'sharper' image then the S1



Radarsat: 2 m, Single-look, Lee filtered:3x3

Radarsat: 2 m, Single-look, Lee filtered:3x3

The noise within RS data despite being Lee filtered. The 'salt and pepper; effect is visible in the channels and within the ponds/rice fields. Left: Greyscale image. Right: Spectral stretch

- Despite the increased resolution over S1, the speckle in the RS single-look imagery prevented further details being classified (channels between rice fields)
- RS has a much smaller swath size then S1 and much lower temporal archive than S1
- **Benefits of RS resolution do not provide overall advantages to S1 when noise, temporal frequency and swath size are considered**

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Connecting Space to Village in the Lower Mekong Region

SERVIR-Mekong is a geospatial data-for-development program that responds to the needs of Lower Mekong countries. Learn more

https://www.planet.com/explorer/#/mosaic/global_monthly_2019_03_mosaic/center/105.499,10.718/zoom/13
Search for a location
Terms
Cover
Nov
Dec
2018
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Daily Imagery
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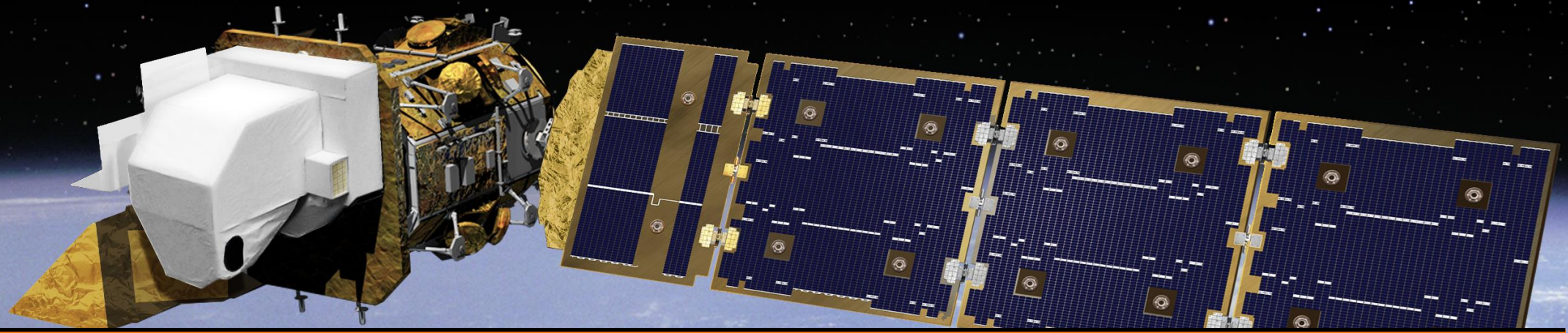
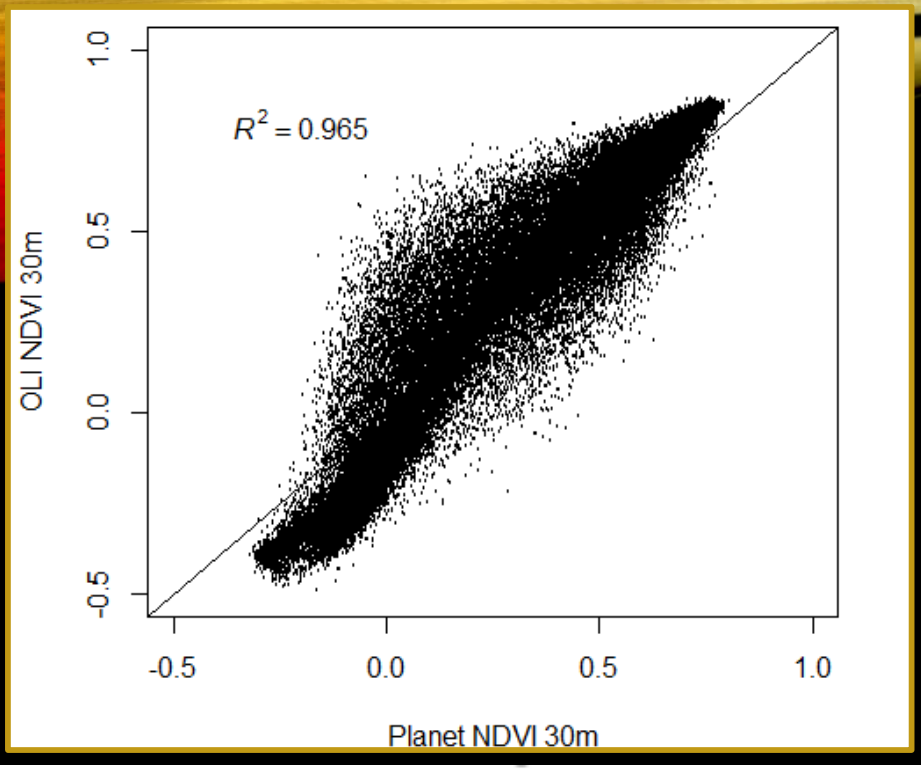
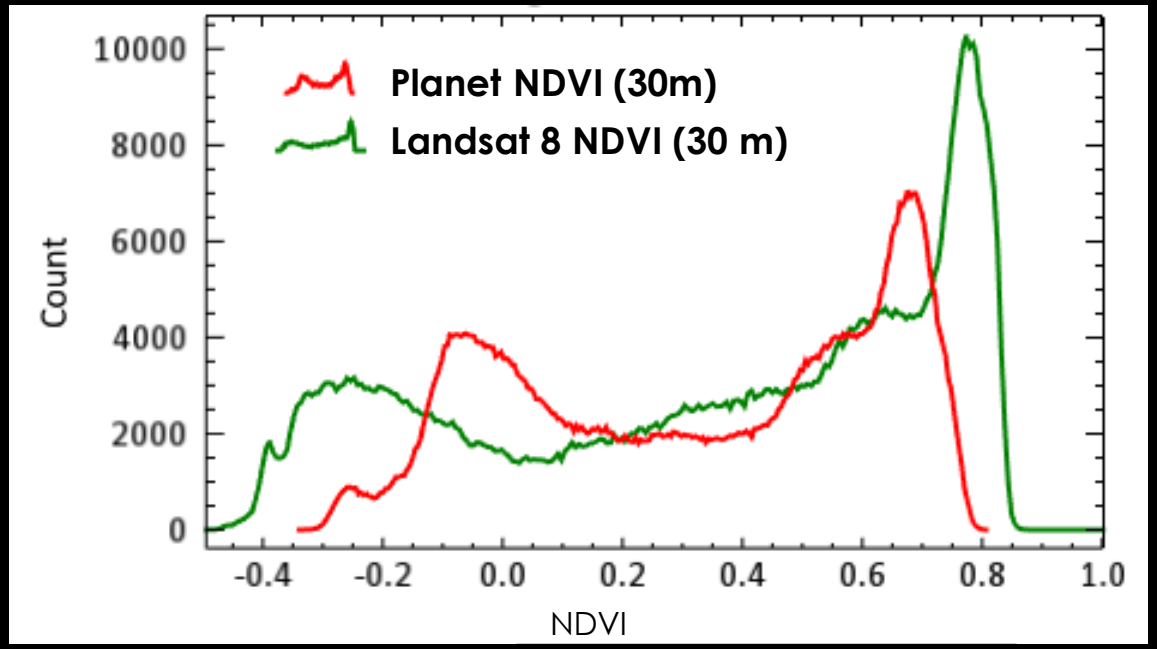
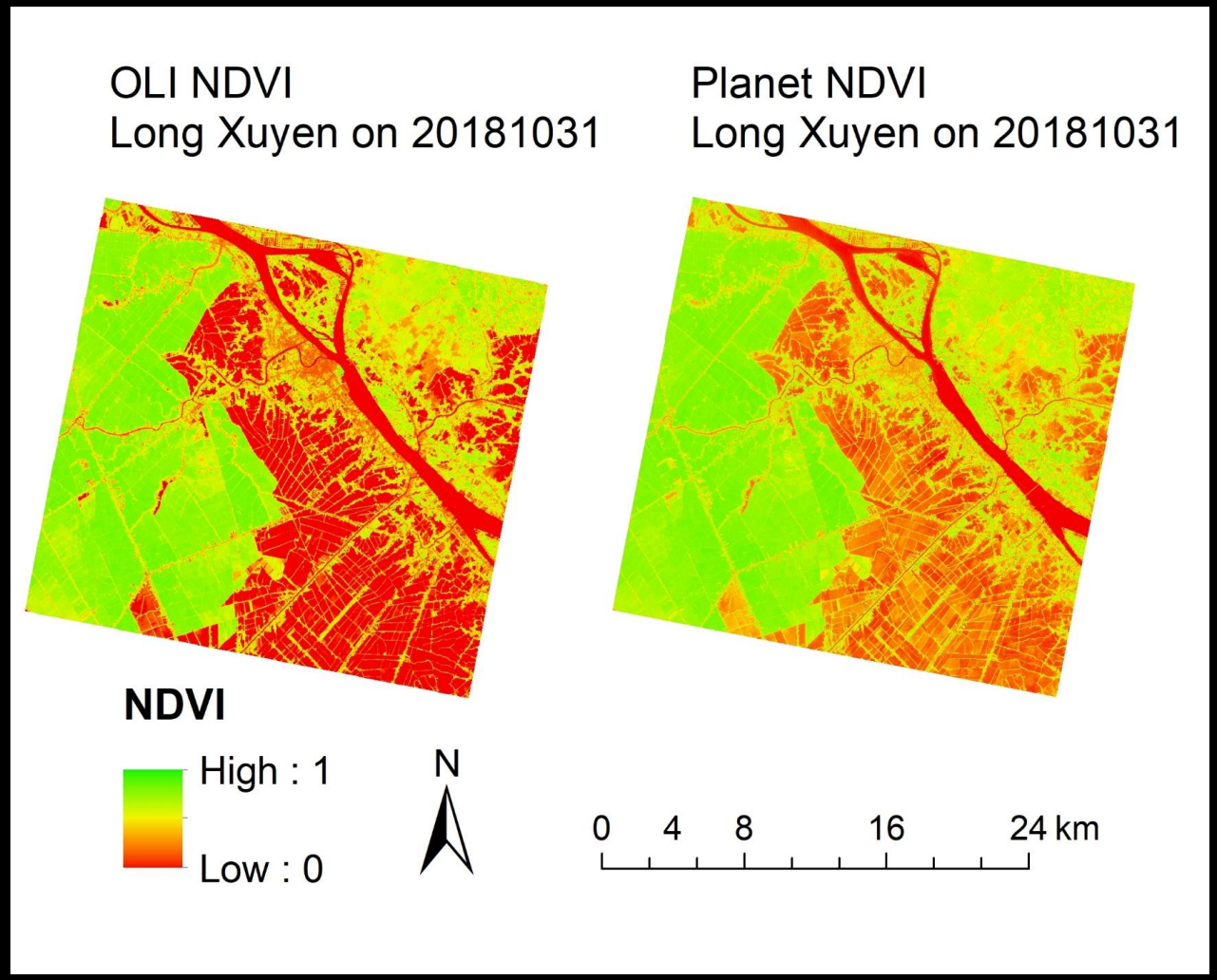


Sensor	Red Band Wavelength (µm)	NIR Band Wavelength (µm)
PlanetScope (3 m)	0.59 to 0.67	0.78 to 0.86
Sentinel-2A (10 m)	0.65 to 0.68	0.785 to 0.899
Landsat 8 (30 m)	0.636 to 0.673	0.851 to 0.879

PLANETSCOPE VS. LANDSAT 8 OLI







LCLUC MODEL

1. Use humanistic and social science data and methods to develop sociocultural and development frameworks of historical and current LCLUC, across the Lower Mekong River provinces of Đồng Tháp and An Giang.

2. Using these qualitative theories of change, create quantitative storyline scenarios with associated LCLUC drivers to projected future changes in LCLU, with a specific focus on agricultural and forestry management and impacts of culture as drivers.

3. GIS-based model of future LCLUC through 2030 within a sociocultural framework for a unique landscape of Southeast Asia

LCLUC MODEL

LCLUC Model for Hòa Hảo Dominant Areas in Southern Việt Nam

Keelin Haynes, Department of Geography, Miami University, hayneskd@miamioh.edu

Committee: Drs. Jessica L. McCarty, Stan Toops, Jing Zhang

Introduction

This project aims to build a predictive LCLUC model for the provinces of An Giang and Đồng Tháp in the Mekong Delta region of southern Viet Nam that will assist local and national officials in mitigating climate change- induced risks to both the population and the agricultural sector.

Recent literature stresses the importance of incorporating local factors into predictive models- particularly cultural and socioeconomic variables. Looking over the last century of history in our study area, one particularly influential element has been a Buddhist sect known as the Hòa Hảo.

The Hòa Hảo live almost entirely within the provinces of An Giang and Đồng Tháp. Sometimes described as protestant Buddhists, they consider living simple lives as rice paddy farmers and villagers to be sacred commandments. This is displayed in their prohibitions against the construction of altars and statues and the importance placed on small holder agriculture in their religious texts.

Selected Study Sites in An Giang and Đồng Tháp Provinces

This belief structure has led them to heavily farm their land, eschew extensive urbanization, and even militarily resist communist economic reforms. This has led to their land being noticeably different than surrounding provinces. This history makes the Hòa Hảo a prime candidate to explore how localized cultural and land use practices can have significant impacts on regional and global economic and food systems.

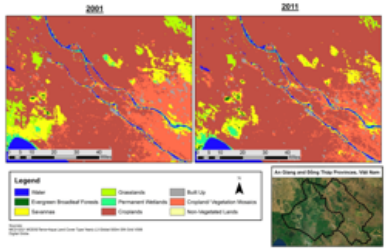
Research Questions

"How has the Hòa Hảo Buddhist community in the Mekong Delta region of Việt Nam driven previous and current LCLUC and what effect will it have on future LCLUC?"

"How can qualitative data, including but not limited to interviews and religious doctrines, be combined with quantitative data to create predictive land cover models?"

MCD12Q1 LCLU in Study Area

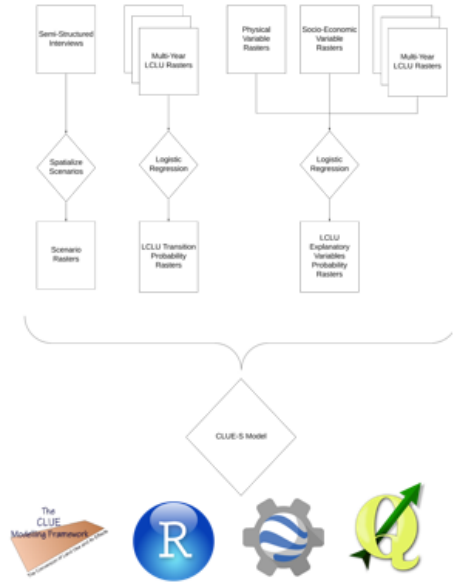
MODIS (Terra + Aqua) Global 500m Yearly Land Cover for An Giang and Đồng Tháp Provinces, Việt Nam in 2001 and 2011



Cropland -> Cropland
Urban -> Urban
Cropland/ Vegetation Mosaic -> Cropland
Cropland/ Vegetation Mosaic -> Urban

Field Work: Jun 4- July 19

LCLUC Modeling Methodology



Acknowledgements

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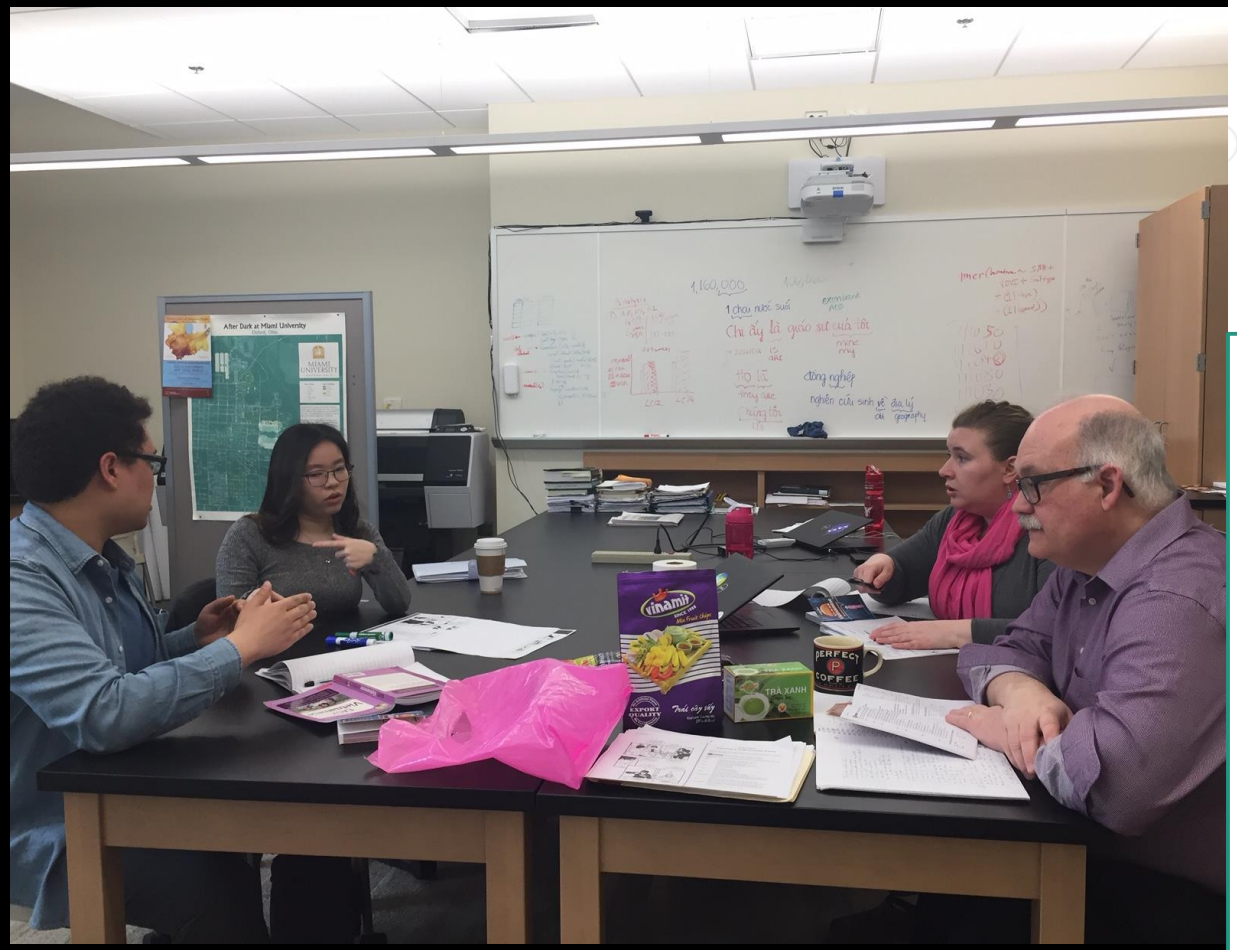
PREPPING FOR 2019 FIELD SEASON



Đơn Đồng Ý và Cho Phép Được Phỏng Vấn và Sử Dụng

Thông Tin Được Cung Cấp bởi Ứng Viên

Kính Gửi Anh/Chị:

Tôi tên là Stanley Toops, hiện tại tôi là giáo sư đang hoạt động giảng dậy tại trường Đại Học Miami tại bang Ohio thuộc Hoa Kỳ. Hiện nay tôi, đại diện cho nhóm nghiên cứu mong muốn được sự cho phép của anh/chị để thực hiện các cuộc phỏng vấn cho đề tài nghiên cứu chúng tôi.

Nhóm nghiên cứu của chúng tôi đang kiểm tra sự thay đổi về độ che phủ và hình thức sử dụng đất ở các tỉnh Đồng Tháp và An Giang. Xin vui lòng đọc mẫu đơn này và nếu anh/chị có bất kỳ câu hỏi nào xin hãy trao đổi với chúng tôi.

Nếu anh/chị đồng ý tham gia vào cuộc nghiên cứu này, tôi sẽ tiến hành một cuộc phỏng

Xin vui lòng cho tôi biết nếu có bất kỳ câu hỏi mà anh/chị không thoải mái trả lời, chúng tôi sẵn sàng bỏ qua những câu hỏi này.

Cuộc phỏng vấn này mang tính chất tự nguyện; nên anh/chị có thể dừng cuộc phỏng vấn vào bất cứ lúc nào với bất kỳ lý do nào.

Tôi sẽ chỉ ghi chép mà không bao gồm danh tính của anh/chị. Tất cả các thông tin sẽ được giữ bí mật. Chỉ có nhóm nghiên cứu của chúng tôi mới có thể truy cập thông tin này. Nếu anh/chị thay đổi câu trả lời về bất kỳ câu hỏi nào; xin vui lòng liên hệ với tôi, thông tin liên lạc của tôi được liệt kê dưới đây.

Anh/Chị có thể liên hệ với tôi, Giáo sư Stanley Toops, tại toopssw@miamioh.edu hoặc (01) 513-529-5558.

Nếu anh/chị có bất kỳ câu hỏi hoặc thắc mắc nào về quyền của mình với tư cách là một ứng viên được phỏng vấn trong nghiên cứu này, anh/chị có thể liên hệ với Phòng Tuân

Land-cover/land- use change (LCLUC) in southern Vietnam, 1980s to present.

Consent statement

I am a professor from Miami University in the United States of America and I am conducting interviews for my research. Our research group is examining the land-cover/land-use change in Đồng Tháp and An Giang provinces. Please read this form carefully and ask any questions you may have.

If you agree to participate in this study, I will conduct an interview with you. I will ask some questions regarding land-use in the area and any changes that you have noted. You are also welcome to talk about related issues. Please let me know if there are any questions you are not comfortable answering, we can skip those questions. This interview is voluntary; you can withdraw anytime with any reason. If you change your idea on any of the questions; please contact me, my contact information is listed below.

I will just take notes without including your identity. All the information will be kept confidential. Only our research team can access this information.

You may contact me, Professor Stanley Toops, at toopssw@miamioh.edu or (01) 513-529-5558. If you have any questions or concerns regarding your rights as a subject in this study, you can contact the Research Compliance of Miami Office at Miami University at (01) 513-529-3600 or humansubjects@miamioh.edu.

Statement of consent: I have read the above information and understand that I can withdraw at any time. I consent to take part in the study. Yes /No?

Interview questions

Questions for small-scale farmers, pastoralists, forest keepers, fishers, farmer union representatives, large-scale agriculturalists.

1. What crops and/or fruits trees are produced? Has this changed from past years?
2. How much land do you farm? Has this changed from past years?
3. What animals are raised? Has this changed from past years?
4. How many animals have you raised? Has this changed from past years?
5. What forest plants are produced? Has this changed from past years?
6. How much forest (size) or windbreaks do you keep? Has this changed from past years?
7. What aquatic products (fish) are produced? Has this changed from past years?
8. How much fish are produced? Has this changed in past years?
9. What changes in land-use or land-cover have you seen in the past years?
10. What road improvements have you seen in the past years?
11. How many new buildings have you seen in the past years? How many renovated buildings have you see in the past years? Have you seen any new construction (for example medical, temples, mining, sluice gates/dikes/ponds) in the past years? In general, what are the sizes of these new constructions?

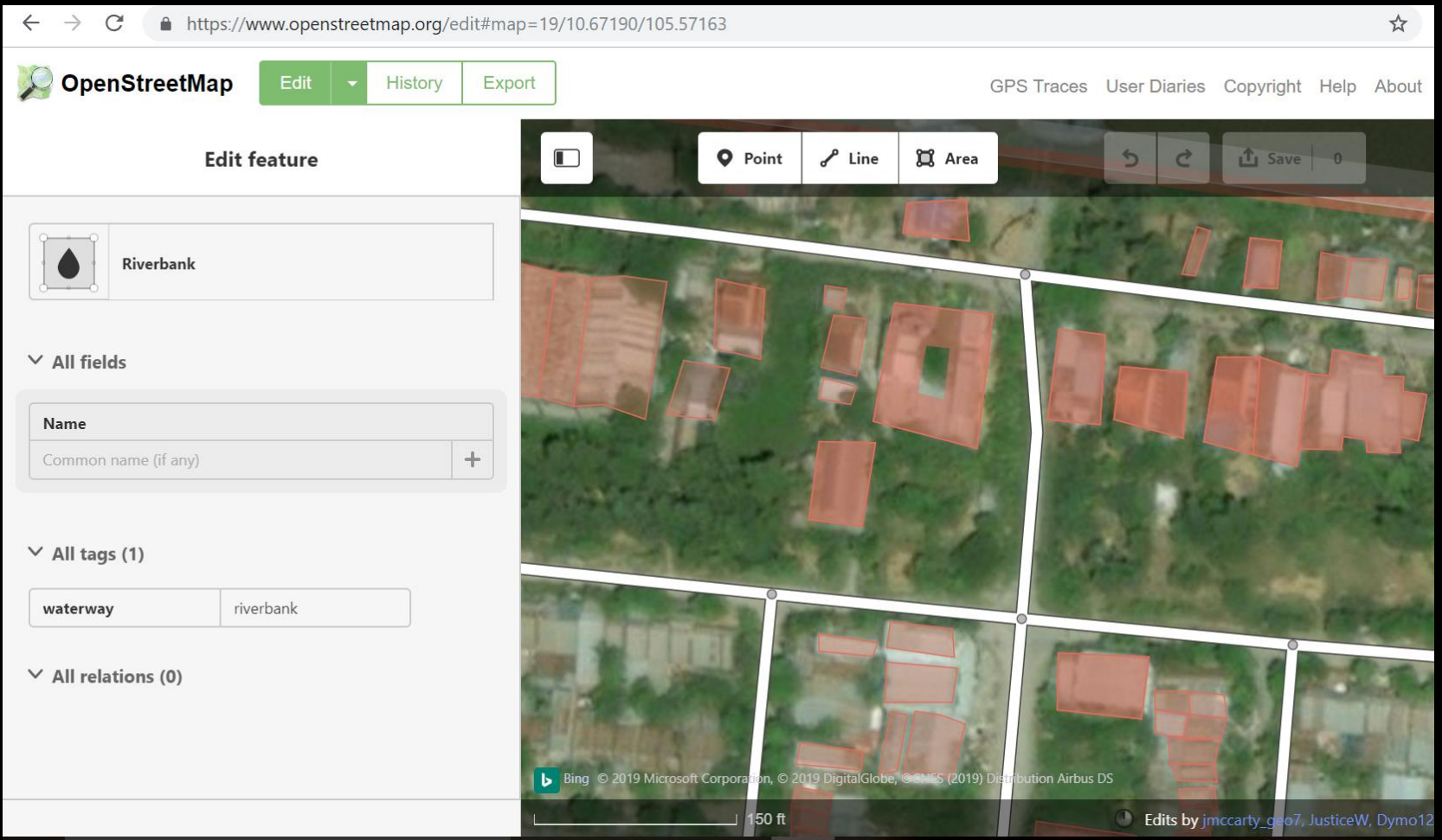
Questions for local agriculture, park and tourism administrators

FIELD SEASON 2019:

20 MAY – 20 JULY

HUMANISTIC, SOCIAL SCIENCE, & NATURAL SCIENCE FIELD METHODS

MCCARTY UNDERGRADUATE RESEARCH GROUP



CO-LED WITH JUSTIN FAIN & KEELIN HAYNES

SPRING 2019

TRAM CHIM

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LONG XUYEN

SAMUEL FLORIANO, ANASTASIA NELSON, JUSTICE WILLIAMS, WILL ZIEGERT

QUESTIONS?