Building Science Identity through UAV and remote sensing technology:

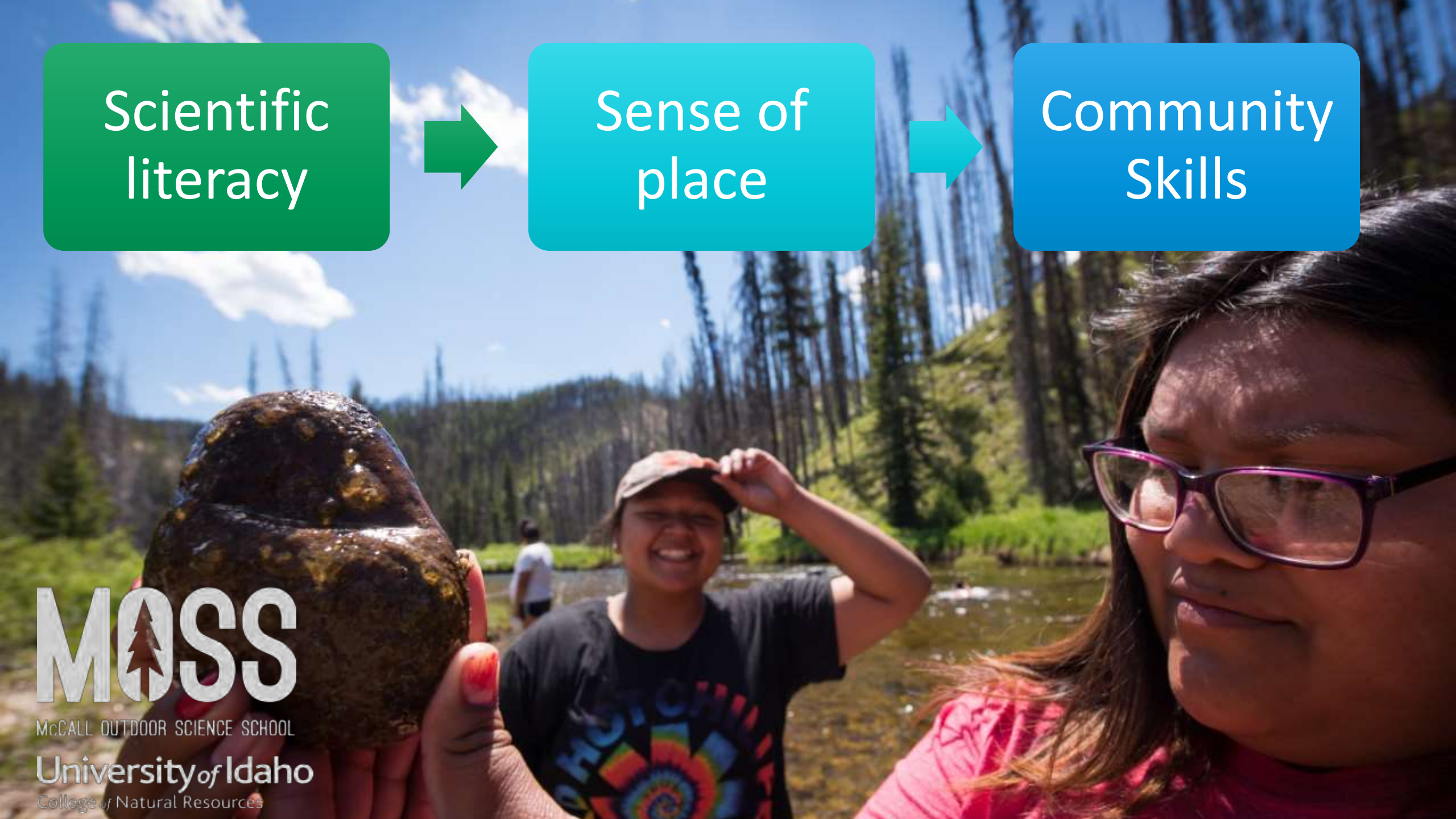
Grand visions and real constraints

Dr. Karla Eitel
Natural Resources and Society
McCall Outdoor Science School

MOSS
McCALL OUTDOOR SCIENCE SCHOOL

NSF ITEST Award # 1513349

University of Idaho
College of Natural Resources


Scientific literacy
Sense of place
Community Skills
MOSS
McCALL OUTDOOR SCIENCE SCHOOL
University of Idaho
College of Natural Resources

The Big Idea

Nez Perce students come from a long tradition of science and use of technology. These are just some of the tools that they can use to solve problems that matter to them, in ways that make sense within their cultural identity.

The Team

UI Team
Karla Eitel (PI)
Jan Eitel (Co-PI)
Teresa Cohn (Co-PI)
Lee Vierling (Co-PI)
Melinda Davis
Raymond Dixon
Randi Bennett
Upward Bound staff

Grad Students
Marcie Carter (NPT)
Alicia Wheeler (NPT)
Ethan White Temple
Christina Uh

Micah Russell
Arjan Meddens

Nez Perce Tribe
Kay Seven (PI)
Silas Whitman
Lee Bourgeau
Leroy Seth
Josiah Pinkham
Thomas Gregory
Angel Sobotta
Ed Main
Liz Eastman
Jeff Cronce
Andrew Saralecos
Kip Kemak
Jay Leighton

Lapwai HS
Devin Boyer
Valerie Ridinger
Josh Nellesen
D'Lisa Pinkham

Intentions

- **1:** Explore the use of UAVs within the cultural context of the Nez Perce Tribe's management of fisheries and natural resources.
- **2:** Prepare students for entry level positions in fisheries and NR jobs with the Tribe.
- **3:** Conduct this work in a way that integrates community needs and perspectives and recognizes the broader community as equal partners (school, NR and Fisheries departments, community in general)
- **4:** Work with students to develop their understanding of their own cultural identity and the way that it intersects with their science identity.
- **5:** Provide culturally responsive curriculum that satisfies dual enrollment course credit for Environmental Science 101-102 through the University of Idaho.

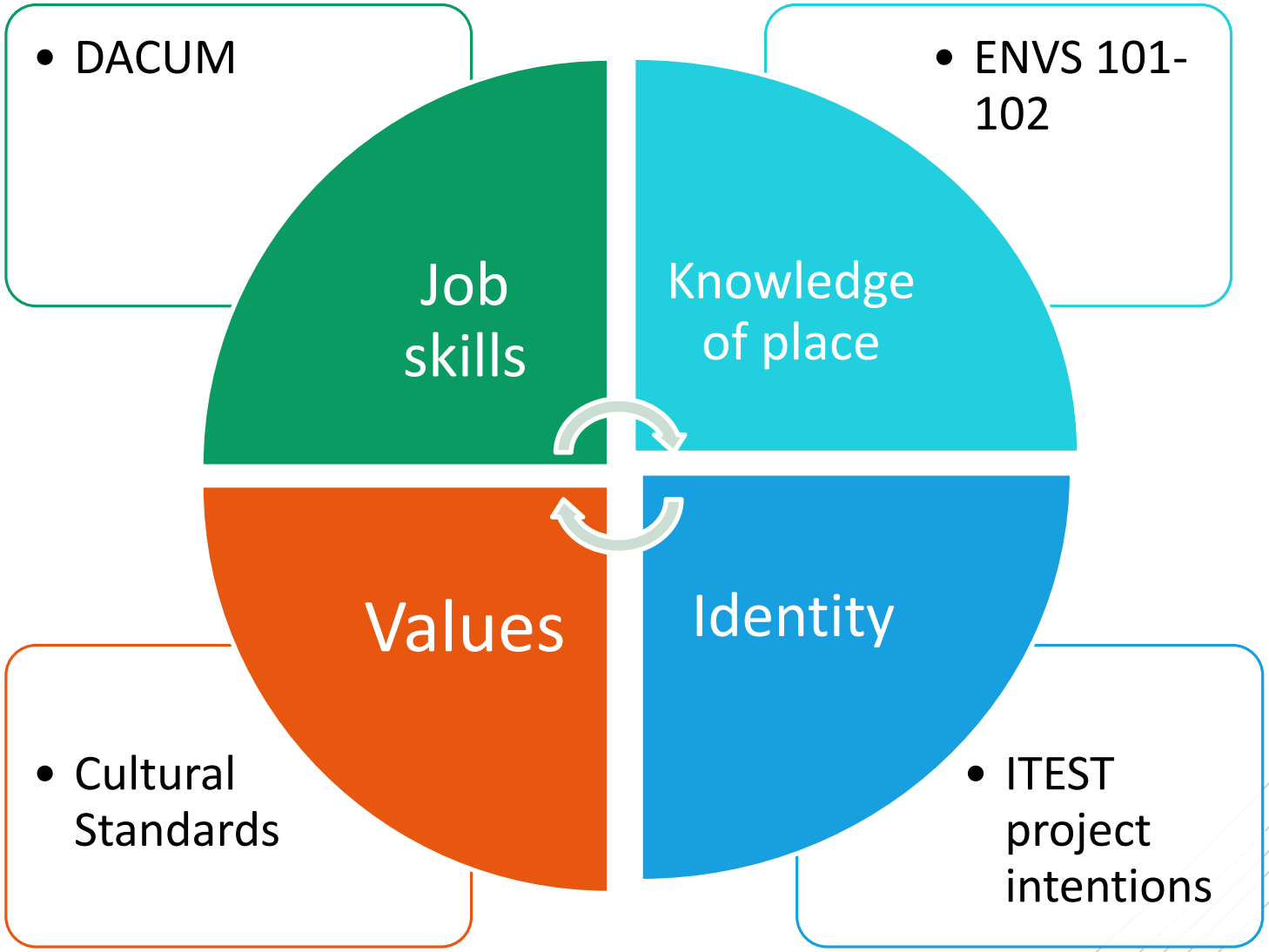
Project Components

Research

School-year Curriculum

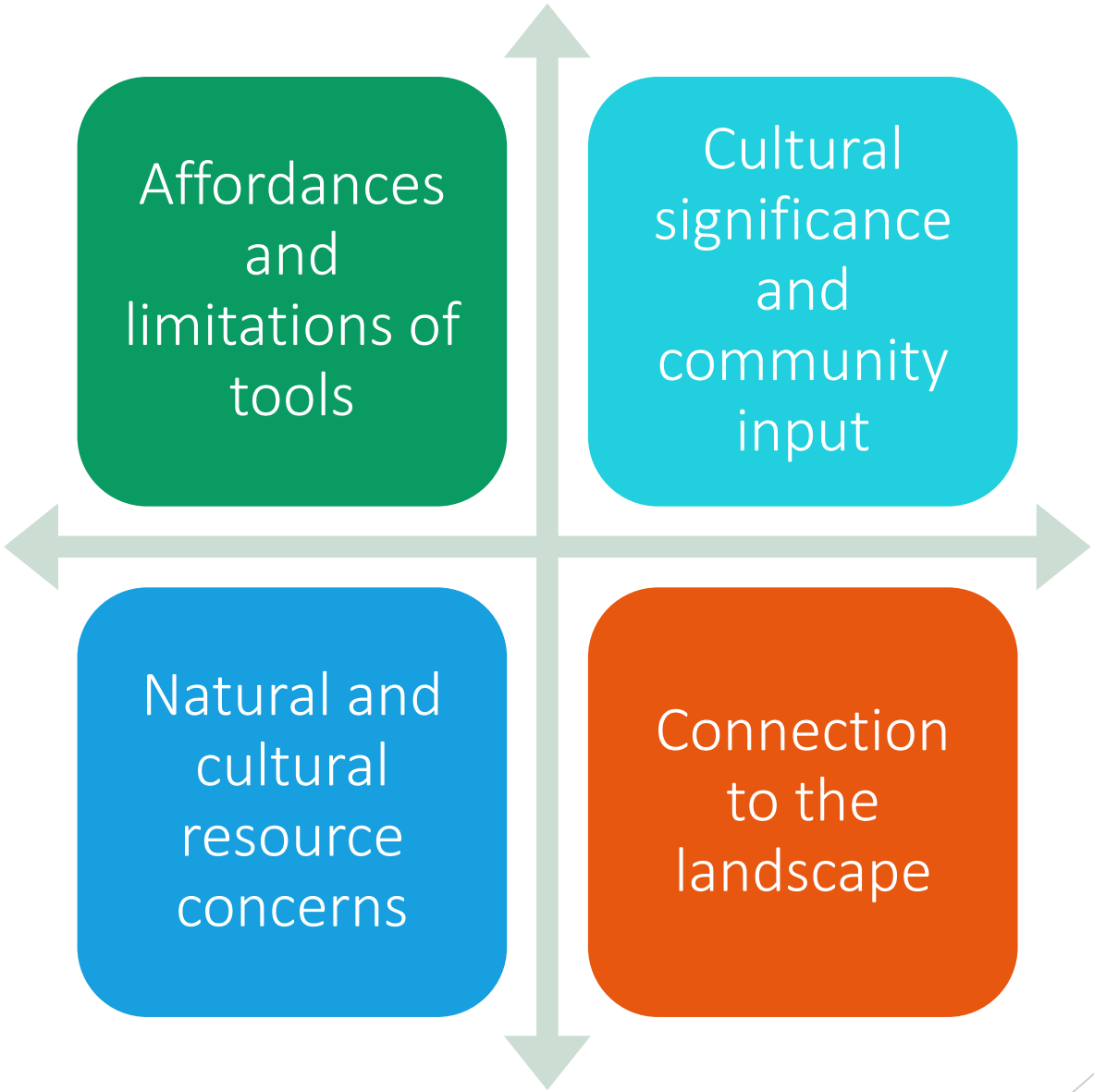
Summer Camp

Curriculum Strands



Philosophy on technology

We use technology to learn about things that we value



Year 1 Summer Camp

- 5 days (40 hours)
- Forestry, fisheries, fire content
- Data collection and analysis with UAVs
- Integrated language and culture
- Student-led project

Year 1 School Year

- 10 weeks (30 hours)
- Forestry and fisheries content
- Data collection and analysis with UAVs
- Integrated language and culture
- Citizen science project on butterflies

Year 2 Summer Camp

- 10 days (80 hours)
- Forestry, fisheries, philosophy, energy, climate change content
- Data collection and analysis with UAVs
- Integrated language and culture
- Student-led projects

Connecting science and culture

Okay, so the bridge between science and culture, something I never saw before. I saw how the elders talk about how science and culture really can go hand in hand, when previously I thought those were two separate things, like how would those go together? But when they talk about the land and how you can protect it, restore it, nurture it and how that plays into a big part of their culture, like, that built a bridge between those two things for me

Connecting science and culture

I thought that culture and science connected when, when we learned, we were learning about the land, how they are using the drones, to look at the vegetation of the land, and streams. How it like, helps save trees, help streams, clear water quality, cause that's part of our culture, the land.

Reflections and Challenges

How to approach the use of UAV and remote sensing technology from a critical theory lens and through culturally responsive practices?

Reflections and Challenges

How to meaningfully work with students to get hands-on experience with UAVs and work in the community while teaching the principles and adhering to regulations?


MOSS
McCALL OUTDOOR SCIENCE SCHOOL
University of Idaho
College of Natural Resources

MMSA
Maine Mathematics and Science Alliance

Civic Engagement

Connecting Research & Society

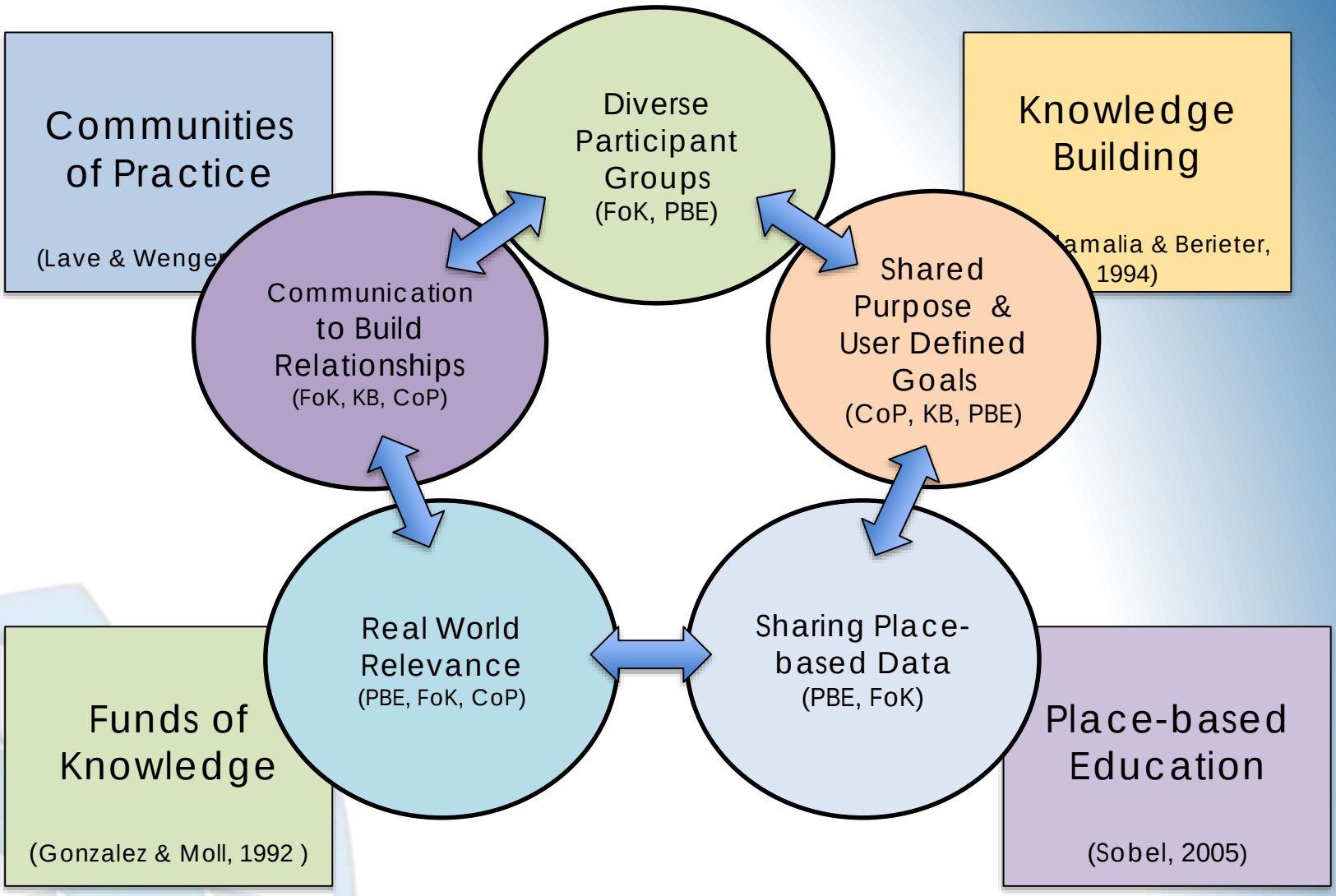
Ruth Kermish-Allen, PhD

Maine Mathematics and Science Alliance

Civic Engagement With Rural Communities

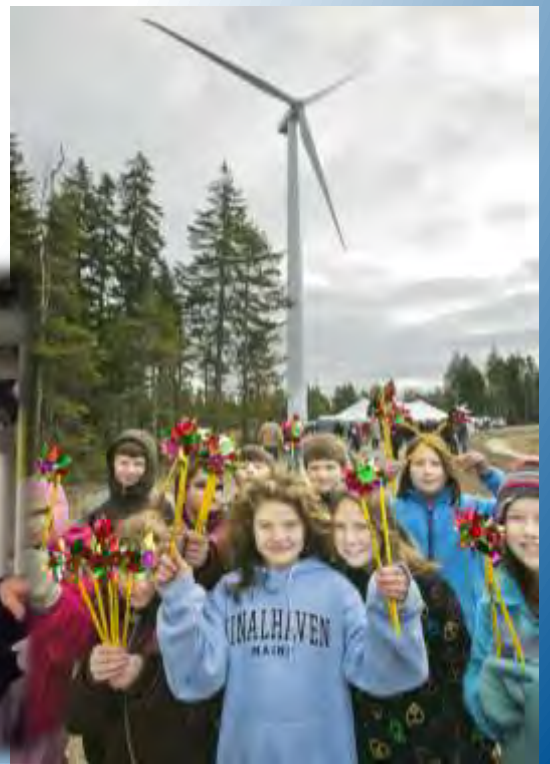
It is not enough for children to learn beliefs and values about what they should do, they need opportunities to learn what they can do.

Theoretical Framework → Conceptual Framework



Community Question:
How much electricity does our community use and how can we decrease it?

leadership | science | technology
energy for me



Leverage Partnerships

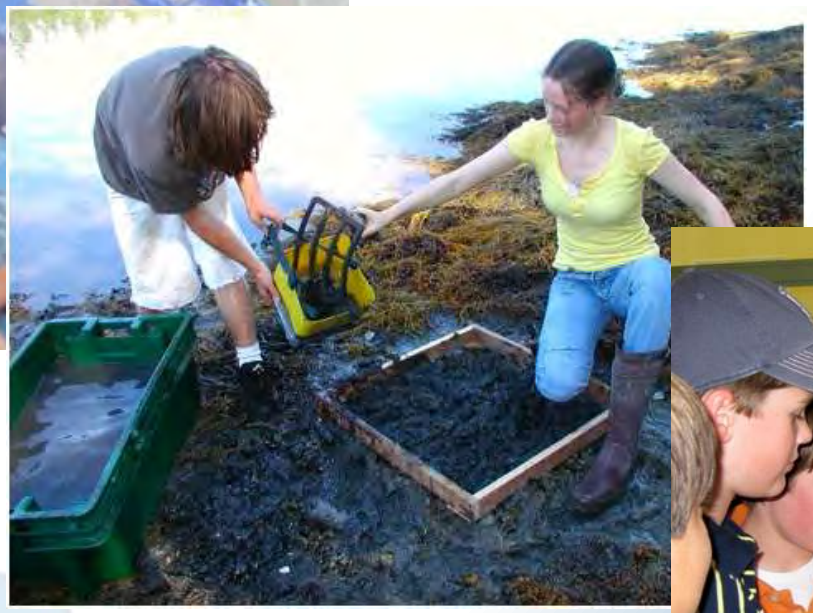
- More than 50 industry partners
- 10 Community Organizations
- Monthly Energy Quests
- Annual Energy Fair

Make It Relevant!

WeatherBlur

Maine Mathematics and Science Alliance

www.weatherblur.com



Participatory from Start to Finish

A WeatherBlur Story

Step 1: Local Question Emerges
Fisherman notice different species in their traps

Step 2: Online Community Building
"*We crafted our investigations offline with members of the local community, but we grew the investigations together with online community members from everywhere.*"

Step 3: Investigation defined
What species live with lobsters today and is that different than the species that lived with lobsters in the past? What could influence the types of species, or bycatch, fishermen pull up in their traps?

Community Question: How are our communities impacted by climate change

Number of male green crabs.

Started by longislandschoolpj - 349 days ago

We are noticing that we catch many more male green crabs than female. Yesterday it was 36 males to 5 females. The time before was 28 males to 6 females. We are wondering why there are so many more males. We are not seeing that with the rock and Jonah crabs.

3 Likes 11 Comments

To reply to this discussion, please Log In

hydrogen1 *301 days ago*

maby you did not measure them correctly.

Green CrabbyPatty *326 days ago*

how deep are your traps? are they near rocky areas or more of a mud flat?

Chebeague Island School *326 days ago*

On Chebeague we are also seeing sigificantly more male than female green crabs. Today we hauled a total of 107 crabs and 84 of them were male. All females were in the small category. We are interested in finding out why this is the case!

Observations | Graphs | Map

Fisherman | Filter By School

May 13th, 2014
Genevieve Kurilec McDonald
5 Likes
1 Comment

May 12th, 2014
David Johnson
5 Likes
1 Comment

December 2nd, 2013
David Johnson
1 Like
1 Comment

April 10th, 2014
David Johnson
6 Likes
2 Comments

October 10th, 2013
Richard Nelson
0 Likes
3 Comments

October 10th, 2013
Richard Nelson
0 Likes
0 Comments

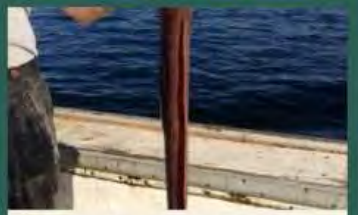
November 25th, 2013
Richard Nelson
0 Likes
1 Comment

March 7th, 2014
David Johnson
3 Likes
4 Comments

October 7th, 2013
Steve Train
0 Likes
4 Comments

October 7th, 2013
Linda Behnken
0 Likes
2 Comments

October 5th, 2013
David Johnson
0 Likes
2 Comments



October 5th, 2013
David Johnson
0 Likes
3 Comments

Community Question:
What types of previously rare species are coming up in lobster traps and why?

WeatherBlur
A PROJECT OF THE ISLAND INSTITUTE

Blurring lines between classroom and community; a cutting-edge interactive online platform for coastal communities to explore weather, climate, storms, geomorphology, oceanography, and more.

2013 Bycatch Investigation

We are interested in understanding what species are present, both now and historically, on the ocean floor. What species live with lobsters today and is that different than the species that lived with lobsters in the past? What could influence the types of species, or bycatch, fishermen pull up in their traps?

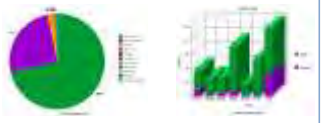
Methods

WeatherBlur schools and fishermen held a DMR Special License which allowed participants to set ventless traps to monitor bycatch. Students set traps off their island's ferry pier and fishermen set traps in depths between 5-12 fathoms. Traps were sampled once per week, October 16 - mid November, 2013.

Peaks Elementary

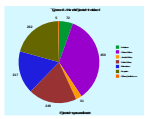
- Green crabs were 49% of the total trap catch
- Male green crabs outnumbered females 58% to 42%
- The smallest green crab caught was 4.5cm and the largest was 9cm

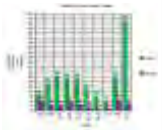
Chebeague Island School



- The majority of our catch has been green crabs, approximately 75%
- We are consistently catching more males than female green crabs
- Most of the green crabs we have been catching are in the small to medium range (6-8cm)

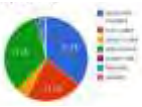
Long Island School





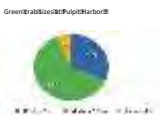
- We found many more green crabs than female green crabs (about 80% to 20%)
- Most of our green crabs were in the medium range of 7-8cm
- Our fishermen did not catch any green crabs and they were hauling in deeper water

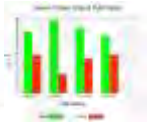
Cliff Island School



- Cliff Island is not catching many green crabs
- Cliff Island's trap is less protected than most of the other trap study sites
- The bottom is sandy, not muddy

North Haven Community School

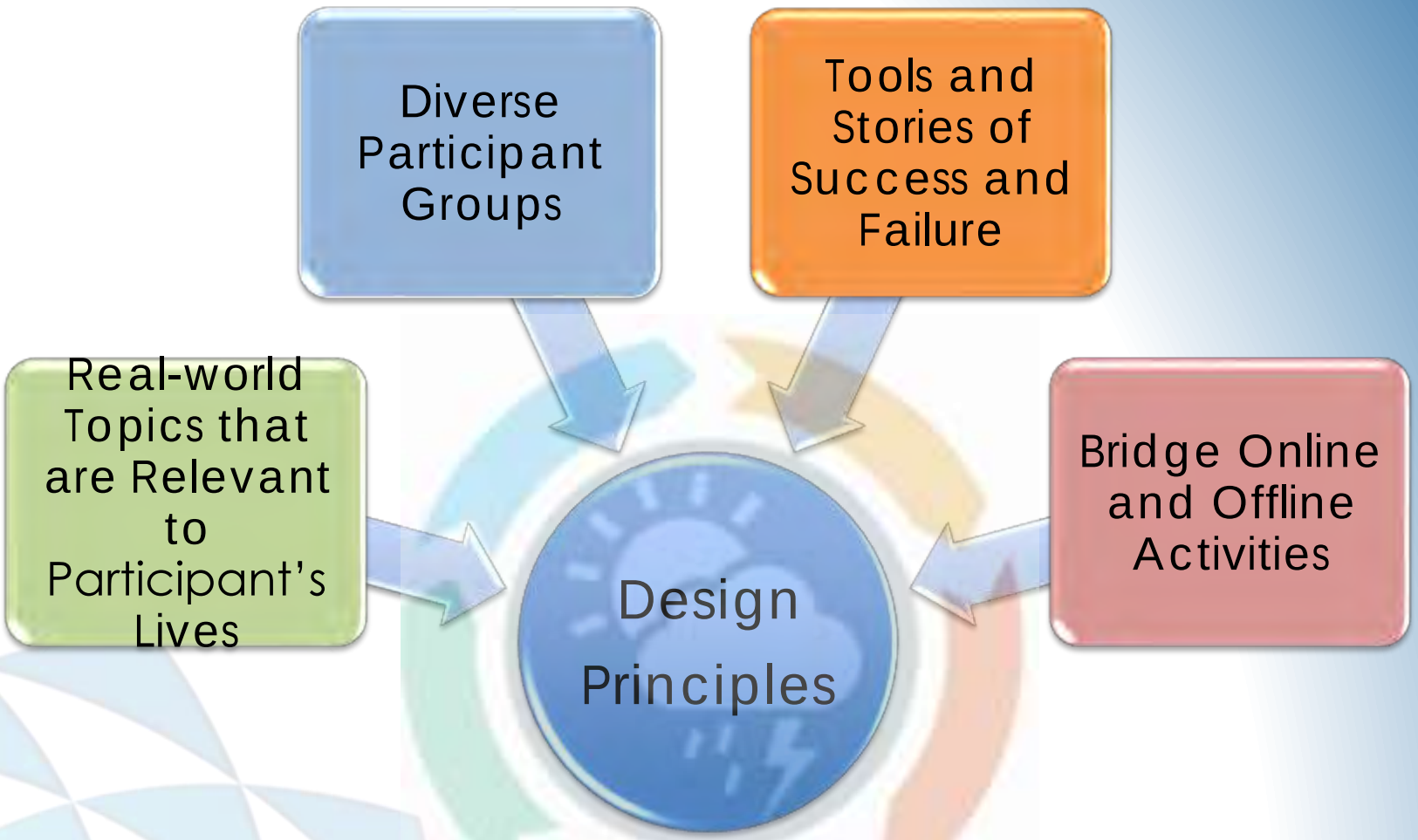




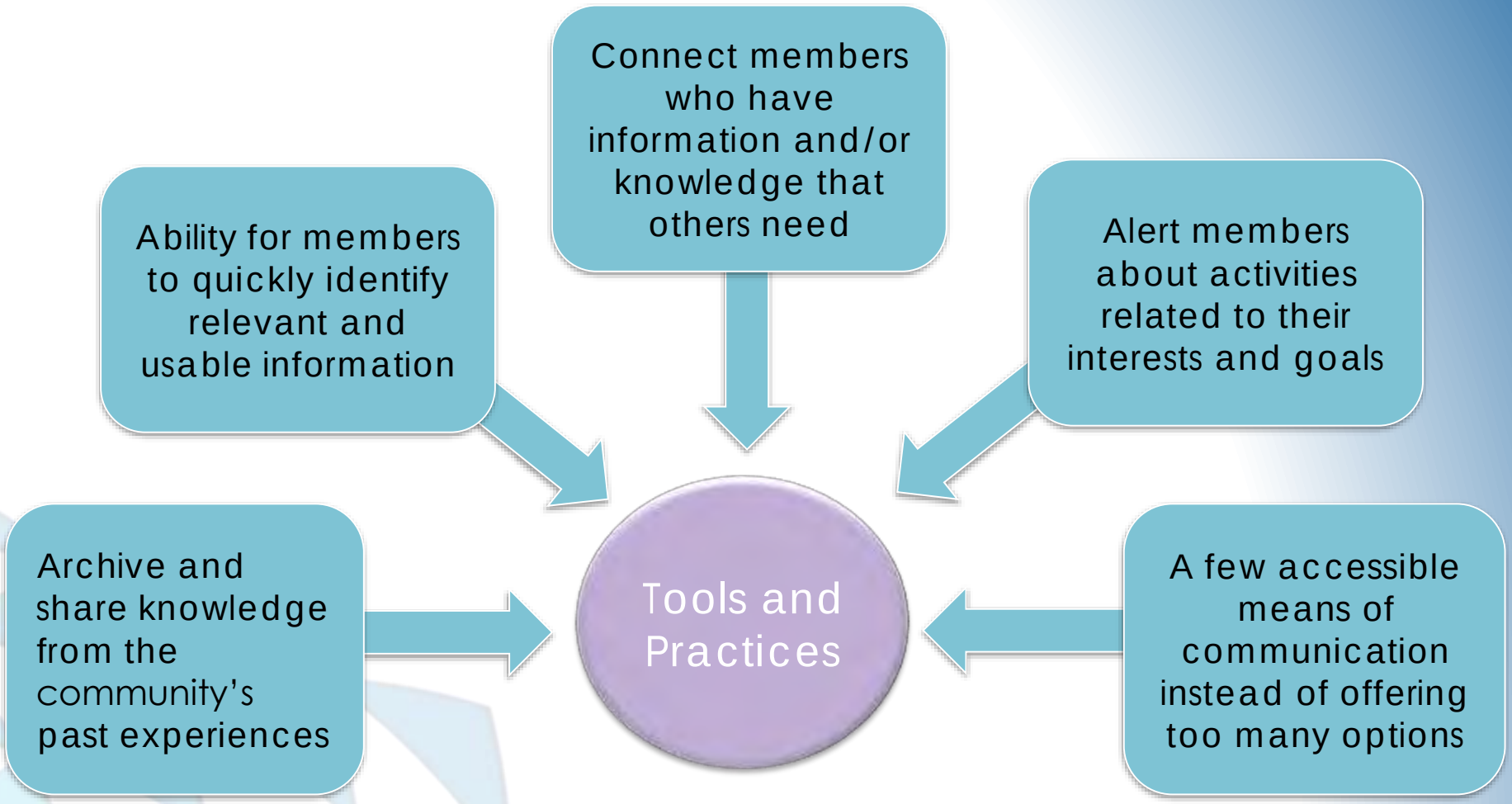
- The average percentage of green crabs caught was 94%
- There were more male green crabs than females
- For every 1 rock crab there were 30 green crabs

How?

What Works
Online Learning Communities for Citizen Science



Design Principles
Technological Functions



MMSA
Maine Mathematics and Science Alliance

Hang Out – Make Media Art – Design Digital Stories

- The summer intensive launches a brand new Augmented Reality (AR) digital storytelling club for girls that will continue from September – December.
- Work with other girls and community members to create your own interactive digital stories about your community.
- Plan a Showcase to present your AR Experience, and explore more ways to connect with other creators.

apply at www.mmsa.org/AR-Girls

MMSA
Maine Mathematics and Science Alliance

Thank You

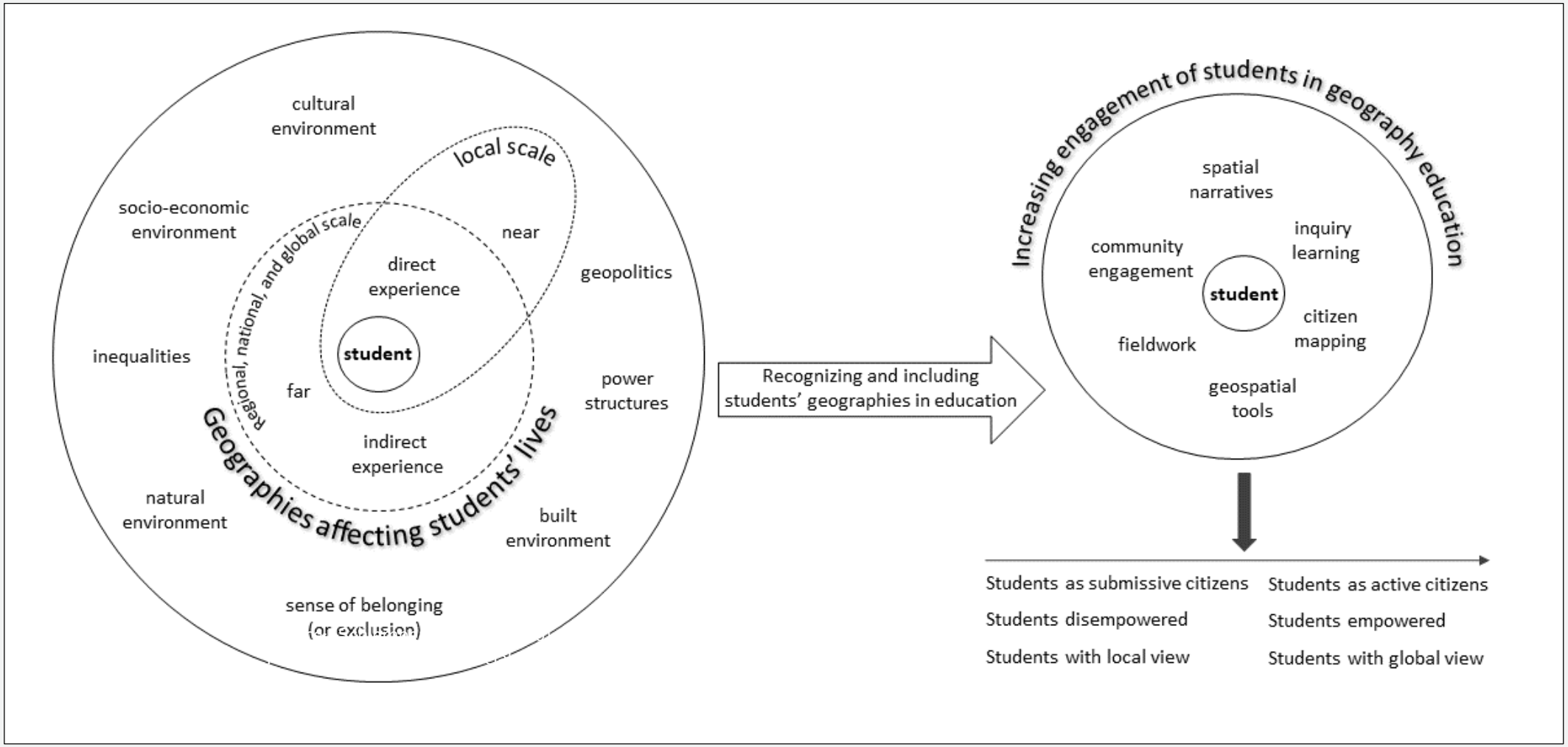
Ruth Kermish-Allen, PhD
Maine Math & Science Alliance
Augusta, Maine
rkermishallen@mmsa.org

INCLUDING STUDENTS' GEOGRAPHIES IN STEM AND CIVICS EDUCATION

Beth Schlemper
Department of Geography and Planning
University of Toledo

Other co-PIs: Kevin Czajkowski, Sujata Shetty, & Victoria Stewart

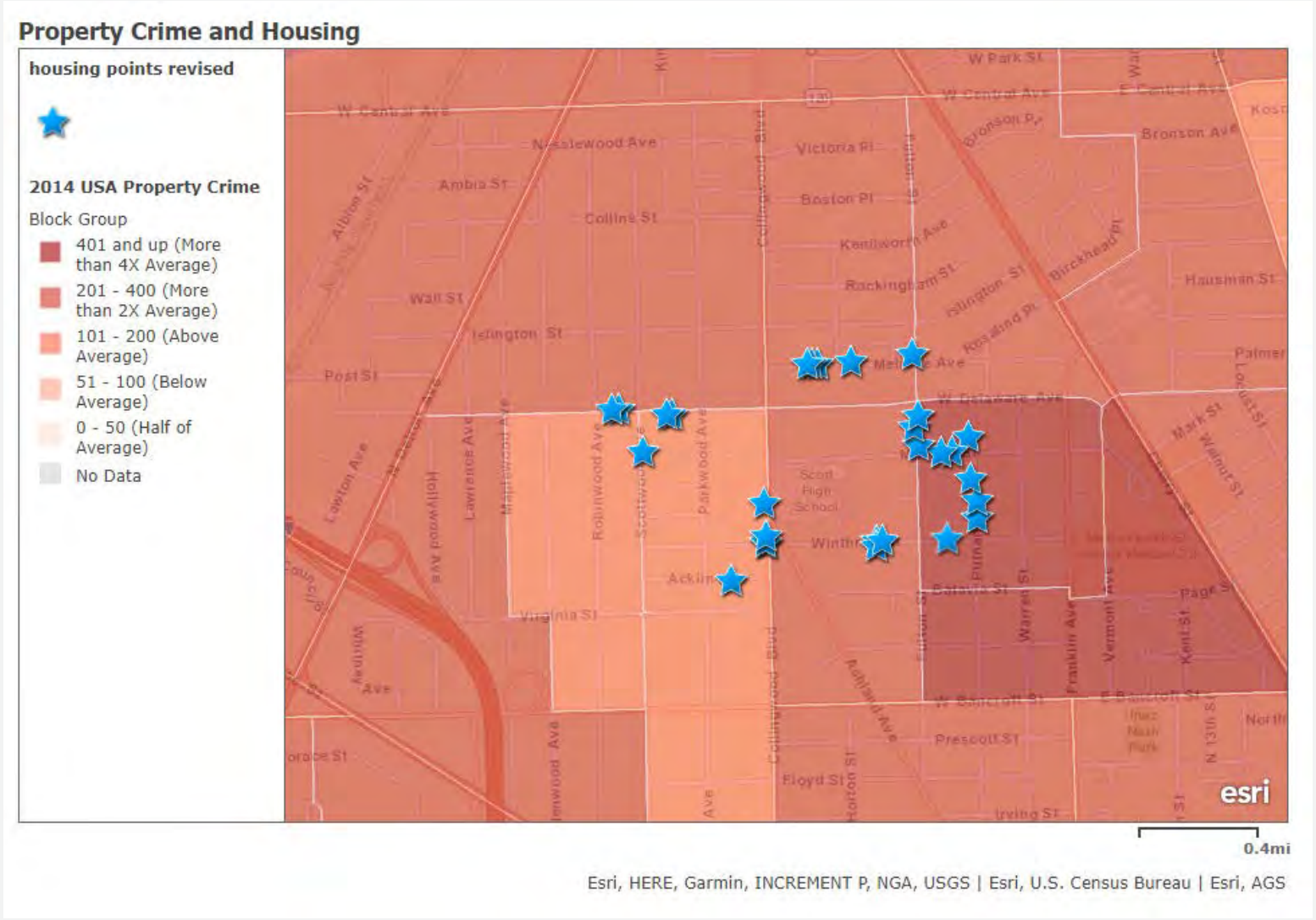
Framework for Including Students' Geographies & Increasing Engagement in STEM & Civics Education



Including Students' Geographies

Using Technology in Engaging Ways

Personalizing Citizenship




from local to global

Case Study: Parks & Community Gardens

BRAINSTORMING

Our topic is community parks and gardens.

Things we already know	Things we want to find out
• We have a community garden by our school • There are other gardens around the neighborhood. • Parks have playgorunds.	• How much does it cost to renovate a park? • How can we get more people to work on gardens? • What can we plant that will help our community? • What is considered a park?

This is worth researching because it is an investment in our community .

Parks & Community Gardens

Research Questions

Questions:

- Are there more recreational activities available to those outside of the Scott High School community?
  - What defines a park?
  - What defines a community garden?

Why were these important?

Our questions are important because they guide us in drawing a conclusion on what it is that our community can do to take pride in its surrounding.

Parks & Community Gardens

WHAT DID WE DO?

Neighborhood attributes:

We traveled to various parks and gardens learning about the activities that the different parks had to offer and what gardens were around the neighborhood.

We used skills such as analyzing data and making graphs to acquire new information

Galliers Park

Parks & Community Gardens

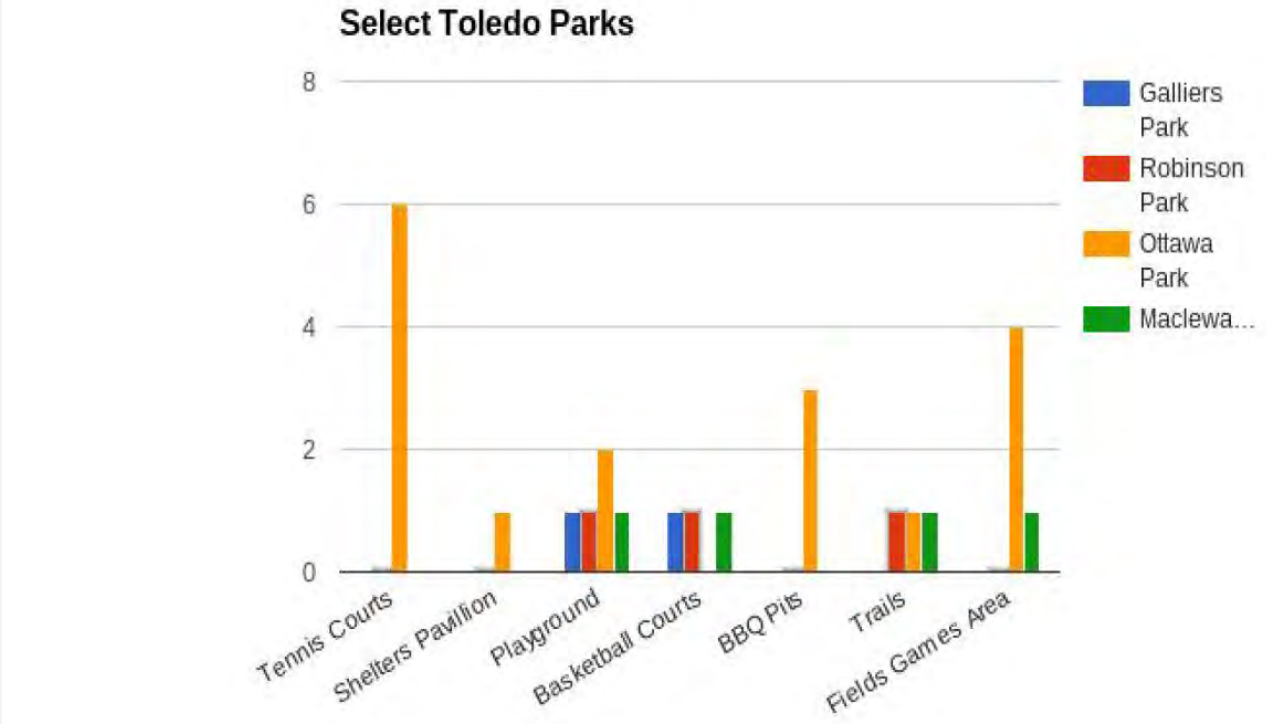
Arc GIS Information

We used Arc GIS to find out where parks and gardens were placed. We found out that there were 34 parks in **District 4** but only 3 active parks within the Jesup W. Scott High School Community. There were also 5 gardens

Glenwood Community garden

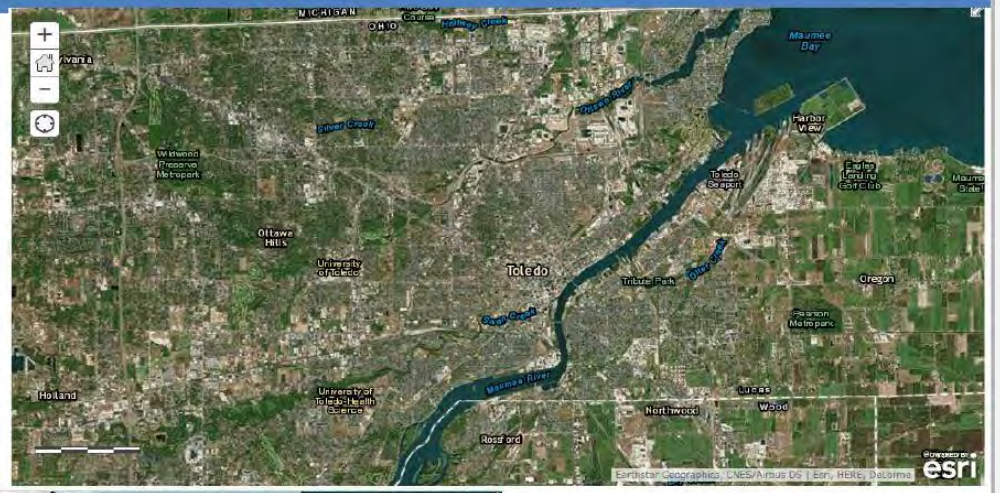
Parks & Community Gardens

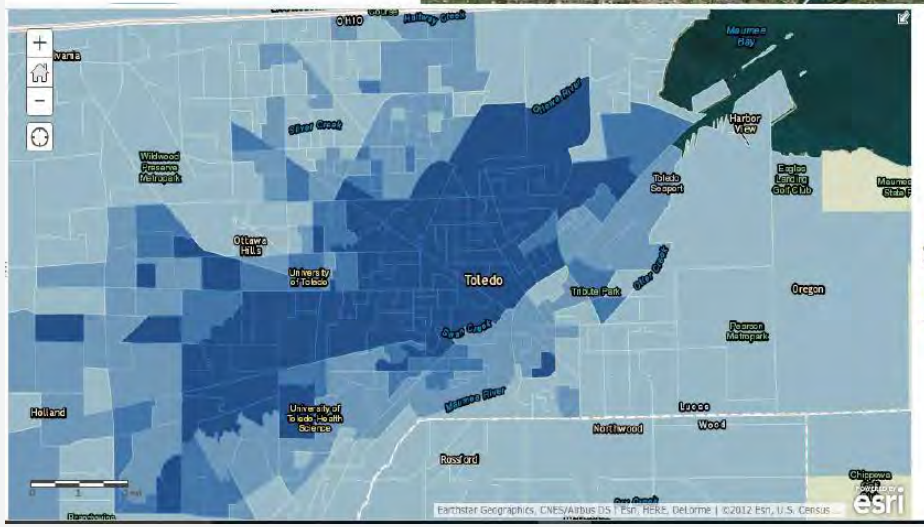
Are there more recreational activities available to those outside of the Scott High School community?



Parks & Community Gardens

The Toledo Area Photograph





African America Census Population

Parks & Community Gardens

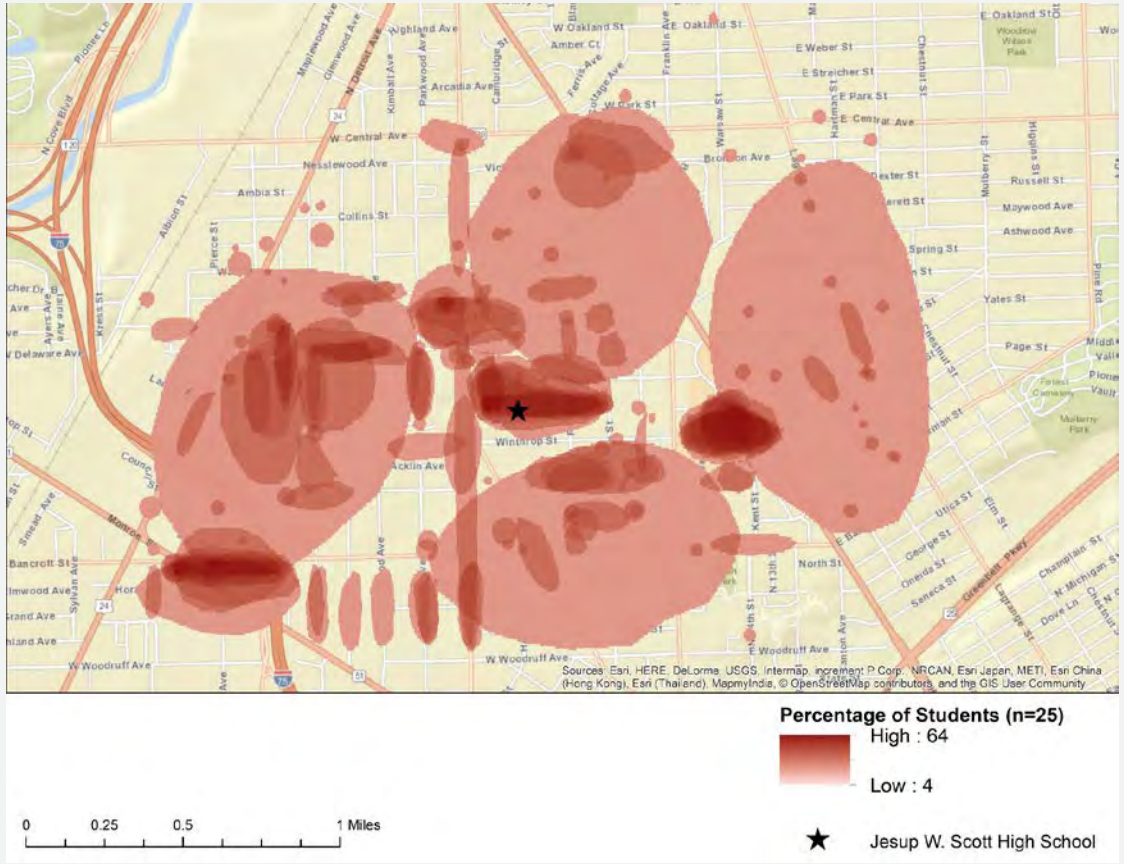
RECOMMENDATIONS

- We need parks that have more to offer within walking distance
- Recruit people within the community to Adopt-a-park or just to help maintain them.

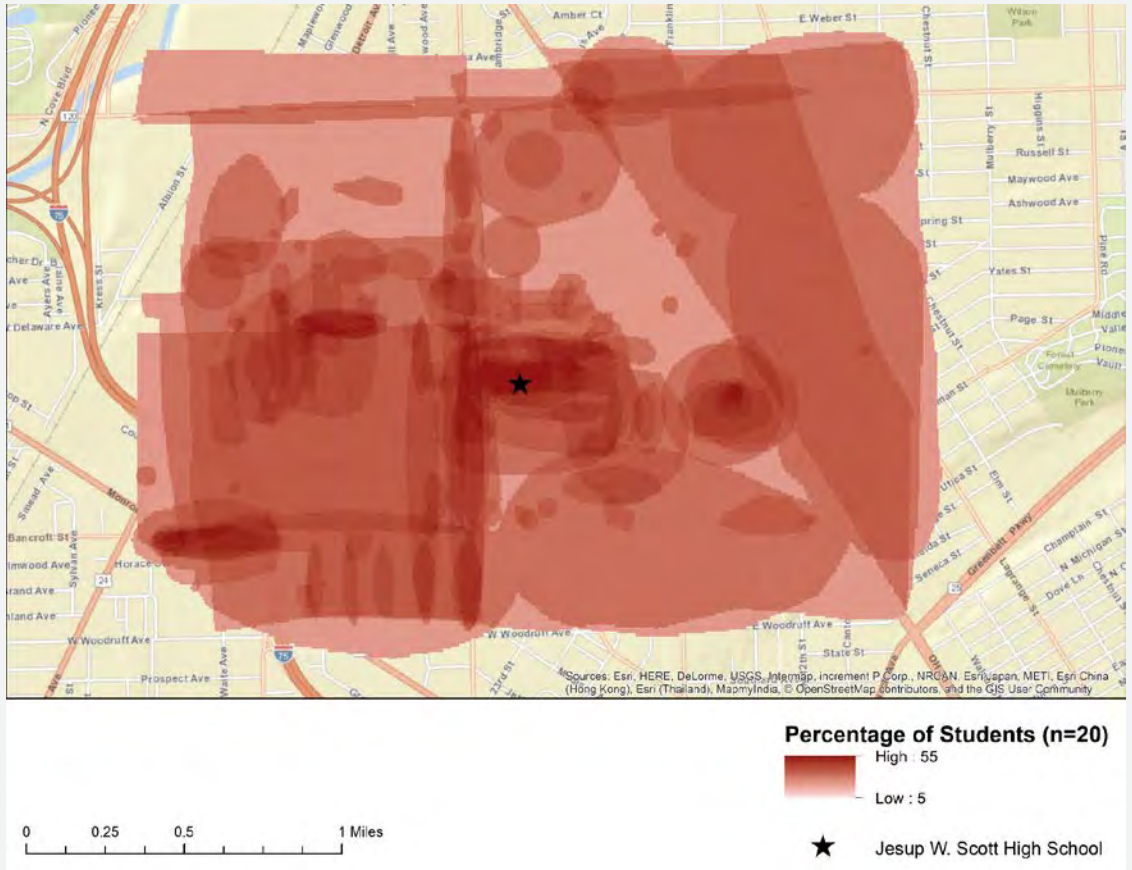
Data for Increasing Awareness & Engagement

Sketch Maps

Students' Familiar Areas First Day of Workshop



Students' Familiar Areas Last Day of Workshop



How did it change their views of the community?

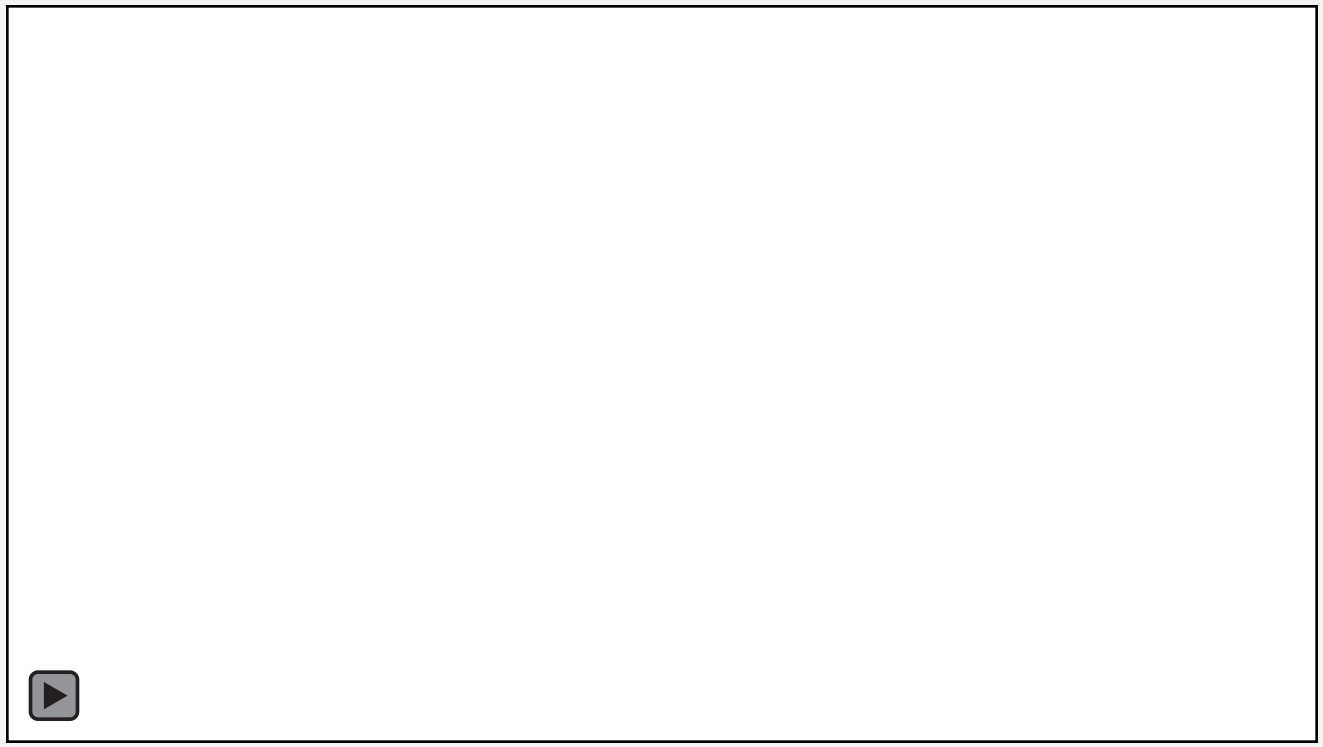
- "Yes the experience did change how I feel because from the different people we had come and talk, the majority of them said it's not that the people in the community don't care. It's just that the different aspect of trying to pay for a house or what's around the neighborhood makes it hard for people to take care of a house, a park or a garden" (11th grade female).

How did it change their views of the community?

- "This experience taught me that I actually care more about my community. It made me care more about my community" (12th grade female).

- "Well, I mean it didn't really change the way I view the community but it also did. It's just like it changed my view a little bit because I didn't really know that there were so many people interacting with the community trying to change it" (9th grade male).

Making a Difference



Supporting Community Engagement

- "I think the students want to connect with their neighborhood and I think this is a different way of connecting. Usually, it's not negative exactly, but we do hear more about the things that are going wrong in neighborhood and not usually what to do to fix it. Almost every student that I've heard has gotten up there and said the reason I did this is because I want to make a real impact and a change in my community" (co-operating high school teacher).

- "If the workshop were offered again next summer, I would definitely recommend it to students because you get to learn about the community and you get to learn about what you can do to better the community" (12th grade female)

Acknowledgements

- Supported by an ITEST grant from the National Science Foundation (DRL-1433574)

- Schlemper, M. B., Stewart, V. C., Shetty, S., & Czajkowski, K. (2018). Including students' geographies in geography education: Spatial narratives, citizen mapping, and social justice. *Theory & Research in Social Education*. doi:10.1080/00933104.2018.1427164

- For more information about the project and to access six related curriculum modules, please visit the project website:
- http://www.utoledo.edu/research/advancing-geospatial-thinking/

Bottom-up Approach: Bridging STEM for Civic Engagement

Lessons learned from Reservoir Project in Sri Lanka to Black Belt Alabama

Ram Alagan

College of Liberal Arts and Social Sciences

Alabama State University

Introduction

This Research explores the integration of STEM and Civic Engagement for consensus building in preparation of a reservoir development

Ram Alagan

College of Liberal Arts and Social Sciences

Alabama State University

Introduction

- The National Reservoir Development – supports water supply and agricultural development to north-central of Sri Lanka
- Project area is socially, culturally, economically and environmentally very sensitive
- Project location has been under major developmental pressures in recent times and the top-down development plans
- It brought undesirable social and environmental consequences and required sustainable and bottom-up plans
- Several families will be relocated second time due reservoir development

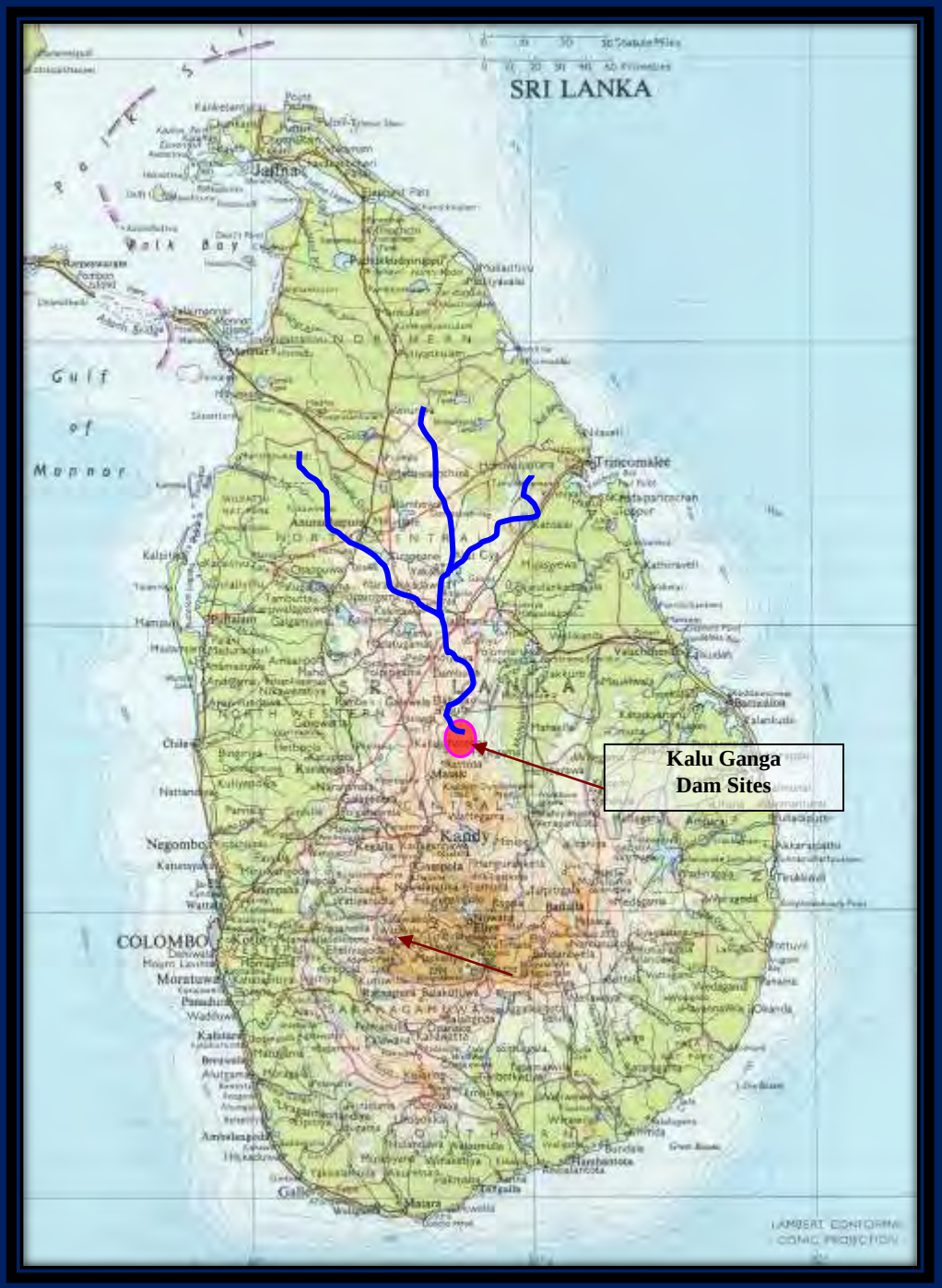
Research Objectives

To explore the strengths of STEM applications in SIA to develop justifiable reservoir development

Research Goal

To what extent STEM methodologies

1. Facilitate the civic engagement
2. Expand data access
3. Improve equity
4. Reduce structural knowledge distortion
5. Broader representation
6. Enhance data review
7. Improve the conventional SIA
8. Achieve sustainable development



Case Study

The Kalu Ganga (Black River) Reservoir is one of the national development projects.

613 local families will be relocated

Project area is highly sensitive in cultural and environmental change

Project Area Background:

Laggala-Pallegama:

1. Remote /under represented community
2. Total population of 12,399 (2001 Census)
3. Culturally and environmentally very sensitive
4. The political ecology of natural resources is favored to rich and politicians
5. Two major National Parks
6. Both parks are rich in elephants and other wildlife.
7. Six local administrative divisions will be directly impacted due to reservoir development
8. Main business district will be totally inundated
9. 613 households and several religious places will be inundated and relocated

Life in Project Area

Life in Project Area

Life in Project Area

Population in Project Area

GN-Name	Total Population	Male	Female	No of Families	No. of Households	Average Households size
Karandamulla	509	274	235	146	138	3.7
Gonawala	219	105	114	67	54	4.1
Miniranketiya	400	213	187	115	98	4.3
Halminiya	458	257	201	130	110	4.4
Pallegama	463	244	219	130	114	4.2
Gangahenwala	70	38	32	25	20	3.5
Total / Average	**2119**	**1131**	**988**	**613**	**534**	**4.0**

Population in Project Area

GN Division	Total Families	Families Receiving Samurdhi	%
Karadamulla	146	85	58
Gonawala	67	28	42
Miniranketiya	115	64	56
Halminiya	130	99	76
Pallegama	130	37	28
Gangahenwala	25	24	96
Total	**613**	**337**	**55**

Bottom-up Approach: Bridging STEM for Civic eNGAGEMENT

Exotic Plan, Biological, Ground Water, Weather, Land transformation, Resource Extraction, Farming, Lumbering, Dairying, Landscaping, Landfill Fertilization, Socio economic conditions, Mineral Recourses, Fauna, Flora, Cultural factors, Land uses, Recreation Aesthetics, Ecological relationship Wilderness, Open Spaces, Parks,

SIA

YES

STEM Data Re-analysis

SIA Team and Civic Engagement Discussion(s)

PGIS + SIA + Civic Engagement

Data Access, Equity,
Broader Representation
Local Knowledge Integration
Community Mapping
Global Position Systems
Multi Media GIS
3D GIS Model

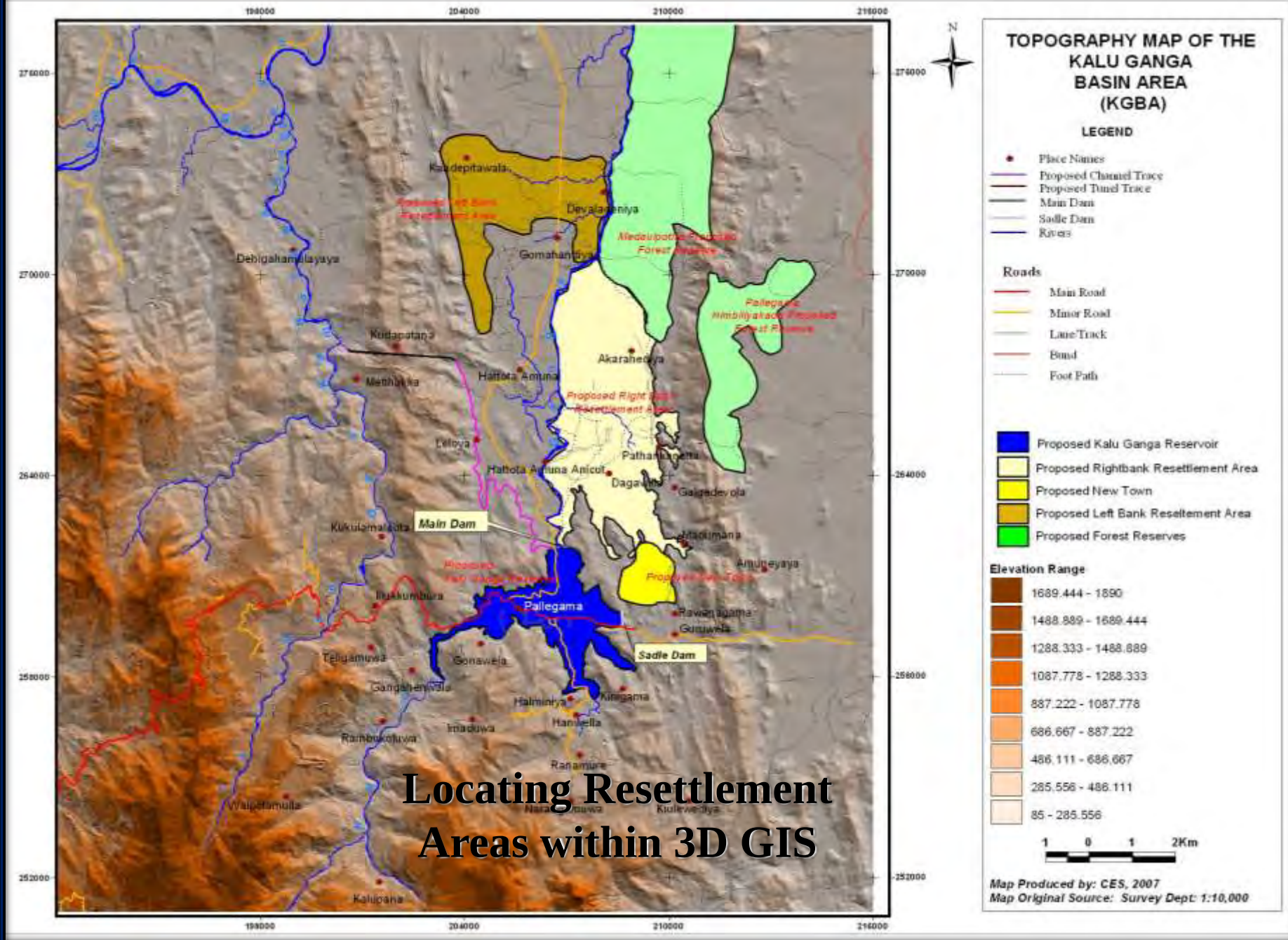
NO

Expert and Civic Engagement for Reservoir SIA

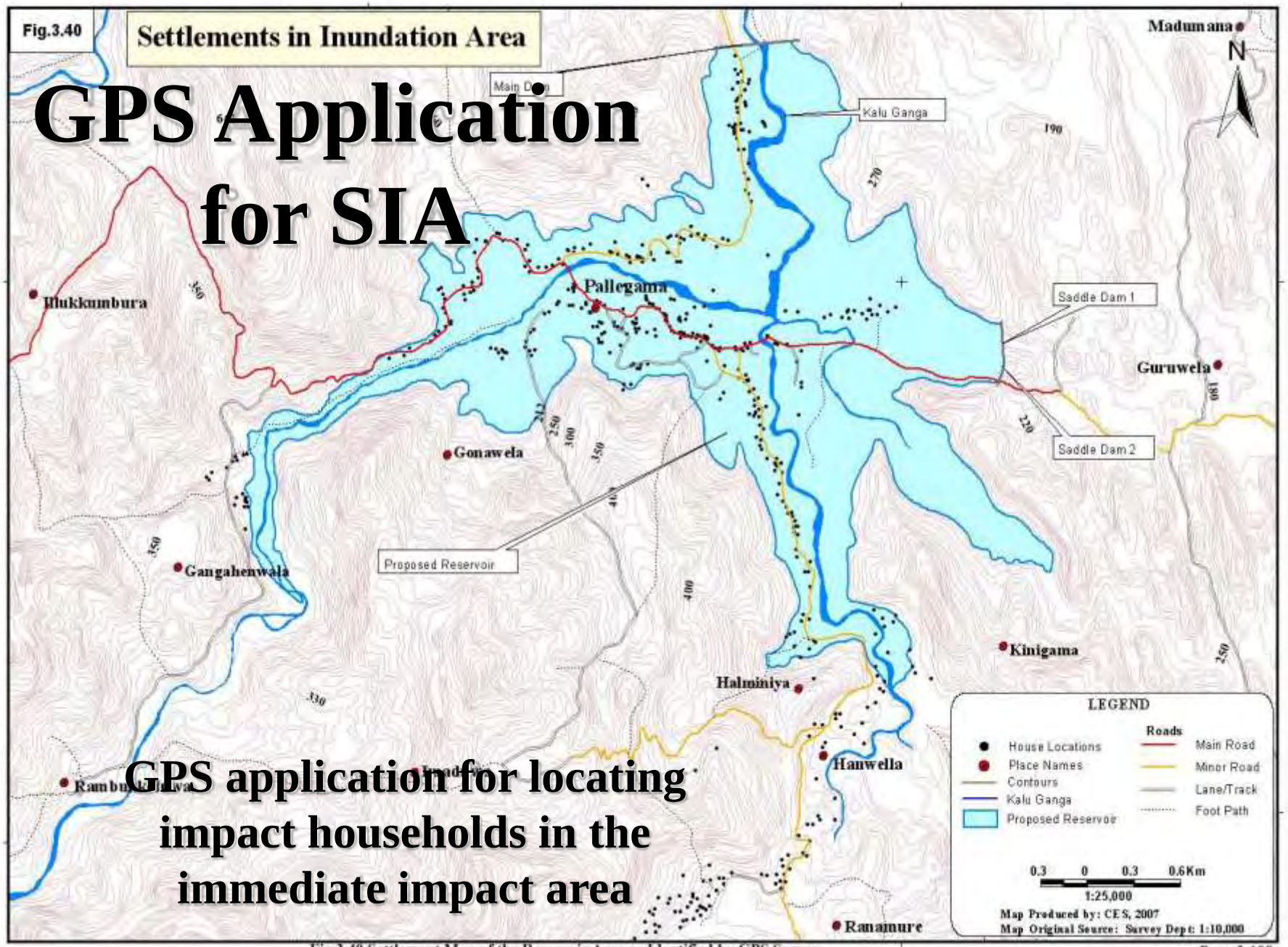
More Civic Engagement

PGIS + SIA for Civic Engagement in Kalu Ganga

1. Local Authority Chairman and Members
2. 6 Divisional Secretaries Chairmen and members
3. Laggala Pallegama Preservation Society members
4. Samurdhi officers
5. Irrigation Department
6. Wildlife Department – officers
7. Farmer organizations
8. Forest Department
9. Environmental groups
10. Local community leaders
11. Religious leaders
12. Political leaders
13. Women groups
14. School boards and children


TOPOGRAPHY MAP OF THE KALU GANGA BASIN AREA (KGBA)
LEGEND
Place Names
Proposed Channel Trace
Proposed Tunnel Trace
Main Dam
Sadle Dam
Rivers
Roads
Main Road
Minor Road
Lane/Track
Bund
Foot Path
Proposed Kalu Ganga Reservoir
Proposed Rightbank Resettlement Area
Proposed New Town
Proposed Left Bank Resettlement Area
Proposed Forest Reserves
Elevation Range
1689.444 - 1890
1488.889 - 1689.444
1288.333 - 1488.889
1087.778 - 1288.333
887.222 - 1087.778
686.667 - 887.222
486.111 - 686.667
285.556 - 486.111
85 - 285.556
1 0 1 2Km
Map Produced by: CES, 2007
Map Original Source: Survey Dept: 1:10,000
N
Main Dam
Sadle Dam
Pallegama
Hathota Amuna Anicut
Locating Resettlement Areas within 3D GIS

GPS Application for SIA



GPS application for locating impact households in the immediate impact area

Fig.3.40 Settlement Map of the Reservoir Area as Identified by GPS Survey

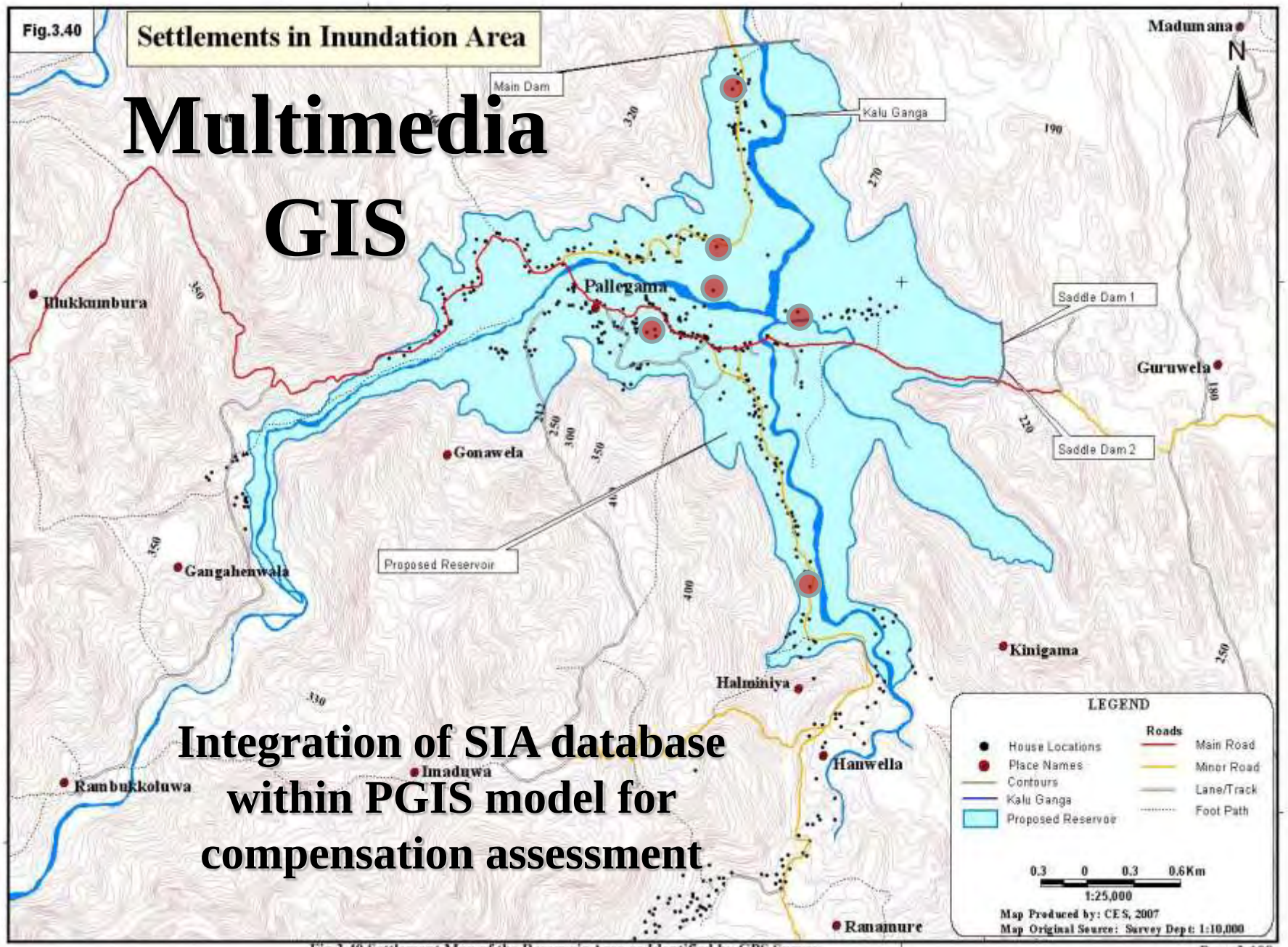
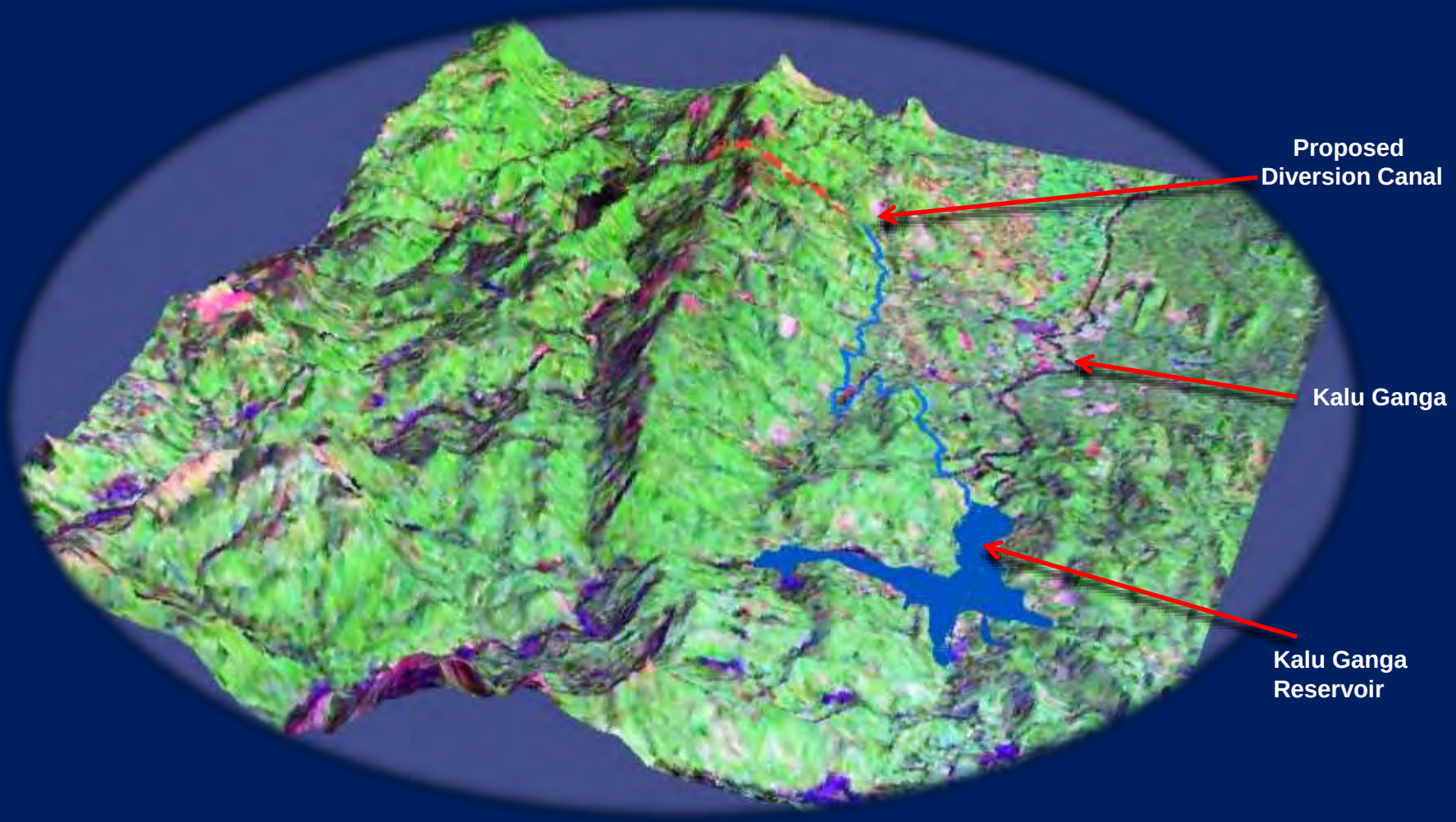
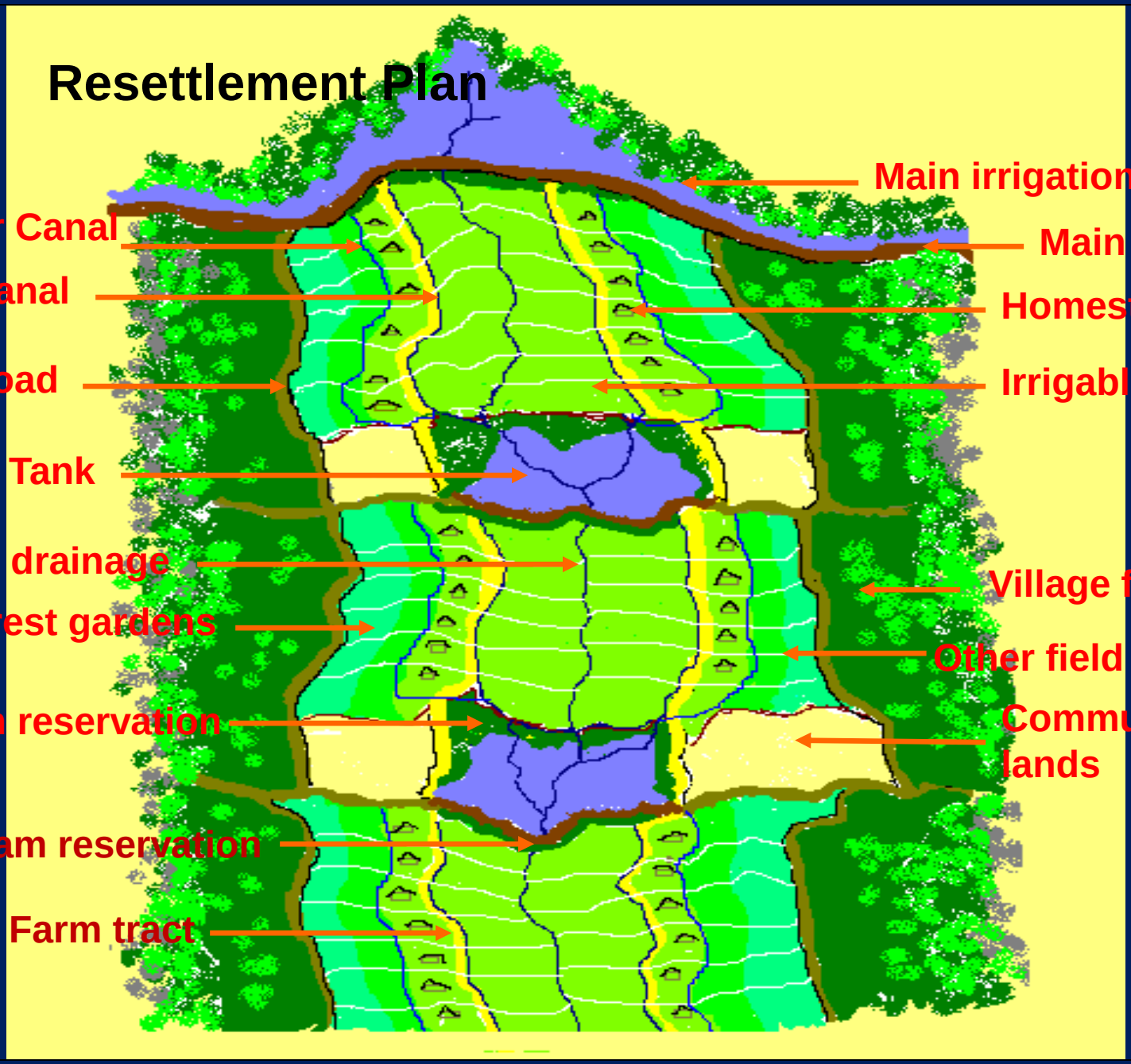


Fig.3.40 Settlement Map of the Reservoir Area as Identified by GPS Survey

3D Model of Kalu Ganga Reservoir



Resettlement Plan



Civic Engagement in Reservoir Development

SIA team Leaders

Guruwela

Gonawela

Data Access and Equity for Re-settlement with Local Community

Date Review with Project Proponent (Ministry of Irrigation)

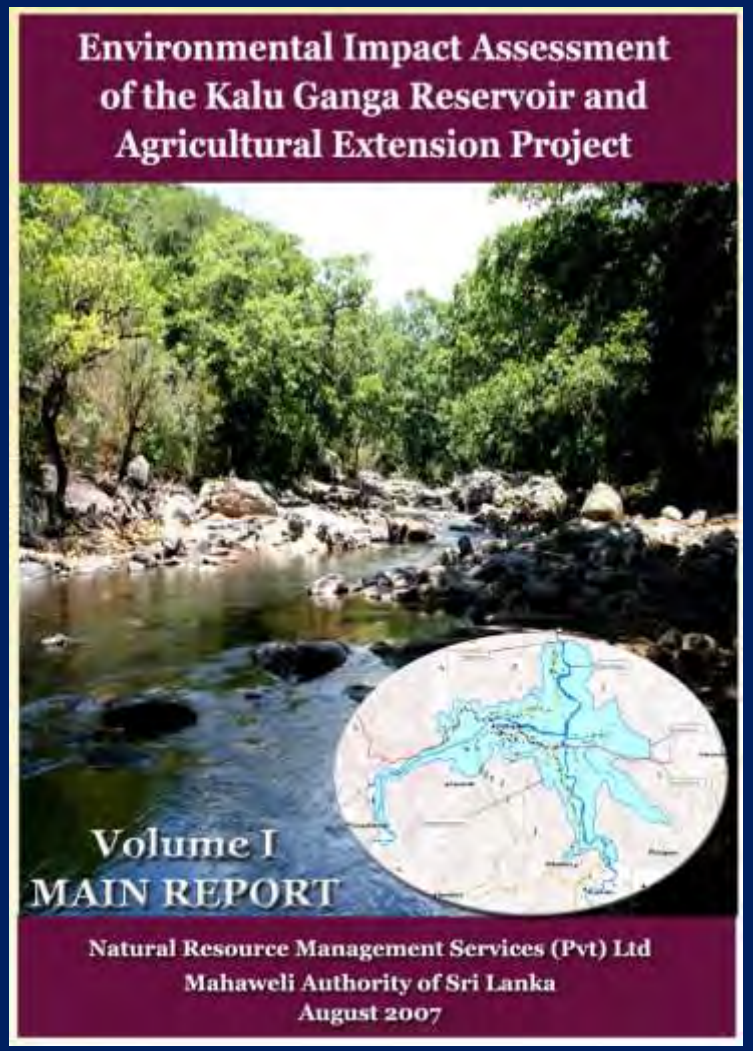
SIA Team Data Review Strategies

Strengths of PGIS +SIA

1. Gather primary information relevant to the Reservoir Development
2. Inquire into the community concerns / opinions about the reservoir development
3. Verify information
4. Provide access and review of project data
5. Raise awareness of the reservoir development
6. Identify problems affecting the local community
7. Identify permissible activities in each impact DS Division
8. Allowed local to voice in project development
9. Initiated reconciliation between PP and Impact groups

Conclusion

1. Local community to participate in reservoir development
2. Understanding about reservoir development
3. Collaboration between experts and local impact communities
4. To support local livelihood and protection of natural environment
5. To minimize the impacts caused by development
6. To minimize the impacts of resettlement and relocation of people
7. To minimize the conflicts between different resource user groups.



Future Plan

Engaging Underrepresented Youths as Environmental Scientists through STEM (Geospatial Technologies) Training, Identity Developmental issues, Build Civic Engagement, and Shape Skills to be a Lifelong Learner for Working in Developments projects

Thank You

Ram Alagan

College of Liberal Arts and Social Sciences

Alabama State University