UNIVERSITY OF HAWAII
MAUI COLLEGE'S
CERTIFICATE OF
COMPETENCE

GIS IN
ECOSYSTEM
MANAGEMENT

# PROGRAM REPORT 2016

PREPARED BY:
SARAH MCLANE BRYAN, GIS EDUCATIONAL SPECIALIST
NICOLETTE VAN DER LEE, OUTREACH & RECRUITMENT COORDINATOR
JANUARY 2016

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View online report and video: maui.hawaii.edu/gis/report

# CERTIFICATE OF COMPETENCE IN GIS IN ECOSYSTEM MANAGEMENT

## What is the definition of GIS?

Geographic Information Systems (GIS) is a computer-based tool that analyzes, stores, manipulates and visualizes geographic information on a map.
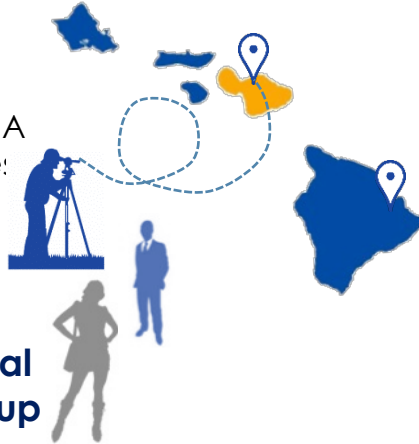
GIS helps us understand **what belongs where.**

## Two 8-Week "Hybrid" courses in One Semester

### GIS 150: Intro to GIS/GPS
(4 credits)

*Learn ArcGIS Desktop and Online software, Collect geographic data with GPS units, Learn to make basic maps with local Hawaii data*

### GIS 180: GIS in Ecosystem Management (4 credits)

*Create Geodatabases, learn spatial analysis and complete self-led projects in ecosystem management*

## Who works in the field of GIS?

GIS is more than just making maps. A map is often what the end user sees.

**Cartographers, database managers, programmers, remote sensing analysts, spatial analysts and surveyors make up the field of GIS.**

## Multi-Island Availability for a Professional's Schedule

GIS 150 and 180 are offered on Maui, Kauai and Hawaii islands. They "hybrid format" means that instructors on each island lead hands-on experiences, and students take lectures and labs at home or on the go.

## Building our Local Technology Economy

High wage, high skill job opportunities in GIS include work in STEM, conservation, tourism, health, resource management, agriculture, government, education and more.

## Applying Skills for Real-World Solutions

Students learn how to collect and analyze GPS data in GIS software, perform basic desktop and online functions, analyze spatial patterns and implement a project to understand real-life questions that could be answered using GIS

## How much Data is Geographic?

It has been estimated that 80% of the informational needs of local government policy makers are related to geographic location.*
This can include addresses, population, income, education, land, vegetation, soils, factory sites, schools, power lines and many more examples.

**80%**

20%

Hawaii based companies want to hire 160 people with GIS skills in the next 5 years.

GIS jobs are growing at a rate of 35% per year **

*Biggs and Garson, 1987
**Bureau of Labor Statistics

# GRANT FUNDING SUPPORTED INNOVATIONS IN GIS

> Accelerated Hybrid Courses offered Fall 2014 – Spring 2016

> RH Grant Consortium led by UHMC included cohorts at KCC, HCC, Molokai (credit) and Lanai (non-credit)

> Technology investments made in laptops, software, and GPS devices

> Employer engagement and job placement results achieved

> Marketing and public relations promoted program to current students and community



**Instructor: Sarah McLane Bryan**
**GIS Educational Specialist**

MS in Geography with industry leadership experience in conservation and public, nonprofit and private sectors

25% Program Management
20% Curriculum and Couse Development
50% Teaching and Course Revision
5% other duties as assigned

# GIS OUTREACH RECRUITED STUDENTS, CONNECTED EMPLOYERS, AND BUILT COMMUNITY

## 300+ subscribers to GIS eNewsletter/Blog



## 120+ views of Social Media Videos



## 1,400+ unique page views at GIS website



**Website attracts diverse visitors** (# of page views):
Maui (150 visitors), Honolulu (100), Big Island (25),
Los Angeles (19), Kauai (6)

**International:** India (38 visitors), Pakistan (22),
Kenya (20), Canada (15), Sweden (12), Belgium (11)
UK (10), Tanzania (9), Germany (7)



## 400+ attendees at GIS events



**Events included:**
> Student Showcases
> GIS Day with MEBD
> BioBlitz at Volcanoes National Park
> ESRI usergroups

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# STUDENTS GROW GIS NETWORK

> Students showcase their final GIS 180 projects and network with GIS industry professionals.

> Social networking event w/ 400+ invites and average of 80 attendees each semester at off-campus venues to connect industry and community to students.

> Requires team of people to setup event, conduct marketing, send/ track invites, event planning, and setup for student projects.

**178 attendees at the Fall 2015 Showcase**

# WHAT STUDENTS SAY ABOUT THE SHOWCASE

"The showcase was great. It gave us an opportunity to show what we had learned and to get our name and faces to the people who are in the industry."
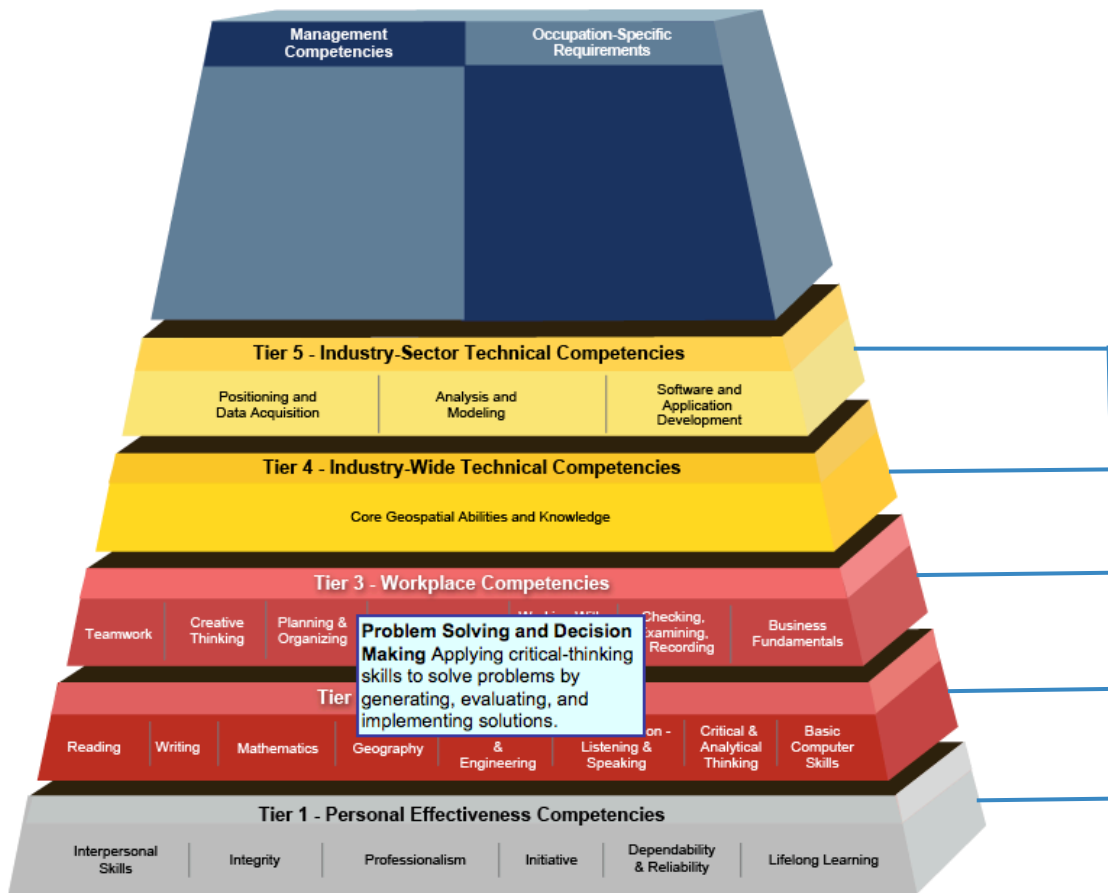


"It met my expectations and beyond. I never expected the turnout to be so great. The presentation aspect was perfect and the people participating made the atmosphere so warm. Can I come next year?"

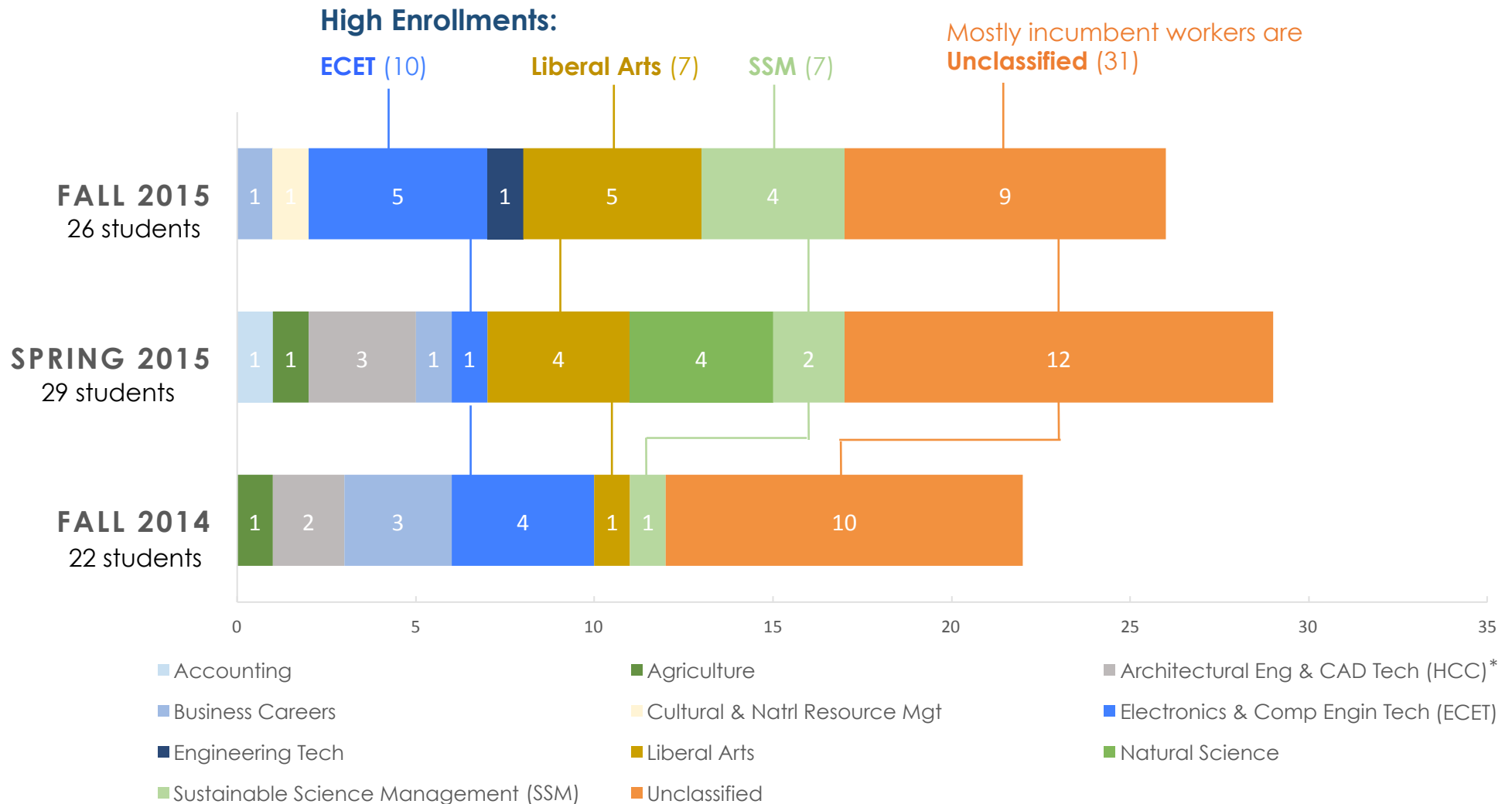# GIS CERTIFICATE BUILDS INDUSTRY STANDARD COMPETENCIES

# DIVERSE MAJORS ENROLL IN GIS 150

**High Enrollments:**

**ECET** (10)    **Liberal Arts** (7)    **SSM** (7)    Mostly incumbent workers are **Unclassified** (31)

**FALL 2015**
26 students

| 1 | 1 | 5 | 1 | 5 | 4 | 9 |

**SPRING 2015**
29 students

| 1 | 1 | 3 | 1 | 1 | 4 | 4 | 2 | 12 |

**FALL 2014**
22 students

| 1 | 2 | 3 | 4 | 1 | 1 | 10 |

0    5    10    15    20    25    30    35

- Accounting
- Agriculture
- Architectural Eng & CAD Tech (HCC)*
- Business Careers
- Cultural & Natrl Resource Mgt
- Electronics & Comp Engin Tech (ECET)
- Engineering Tech
- Liberal Arts
- Natural Science
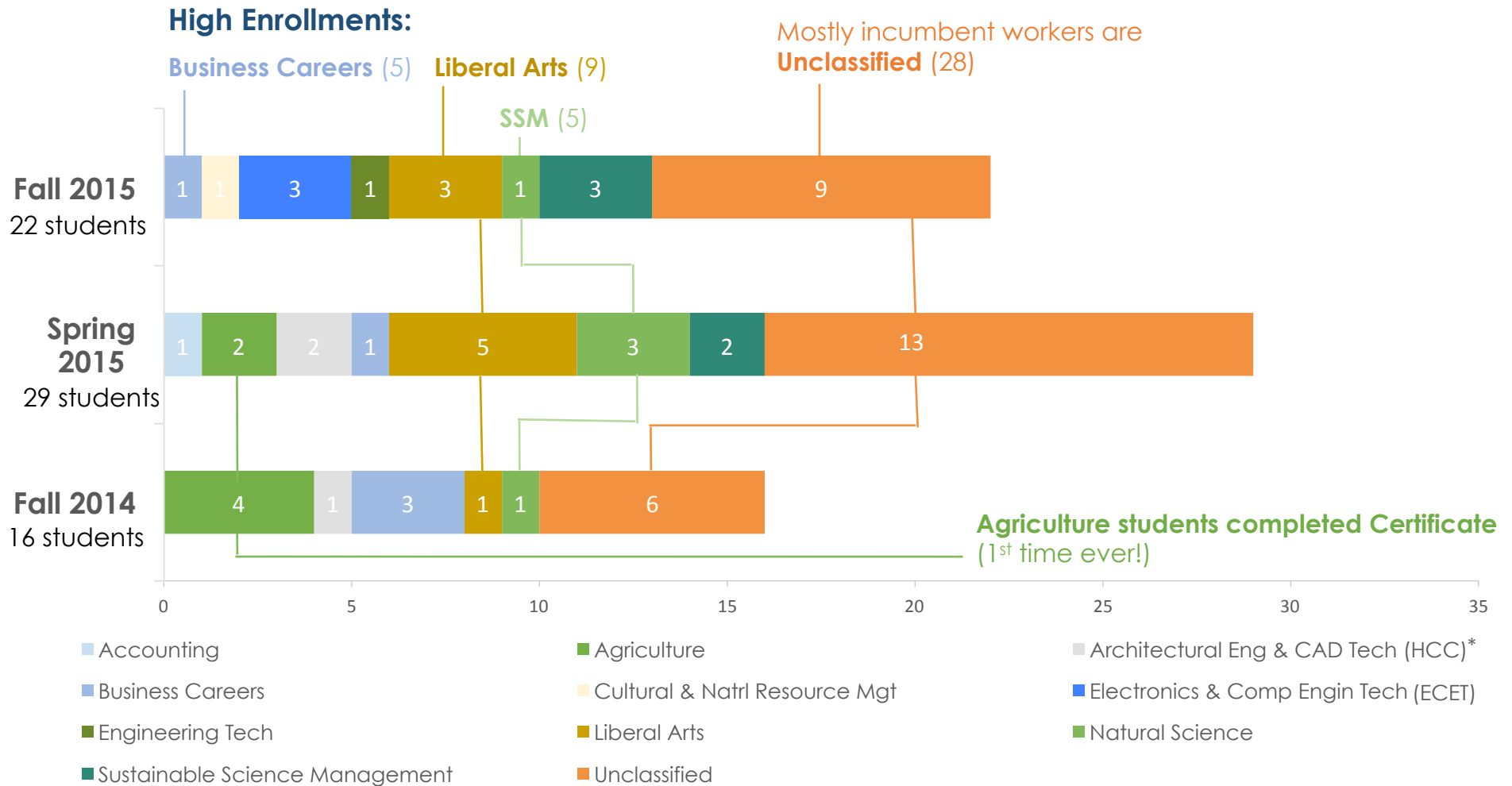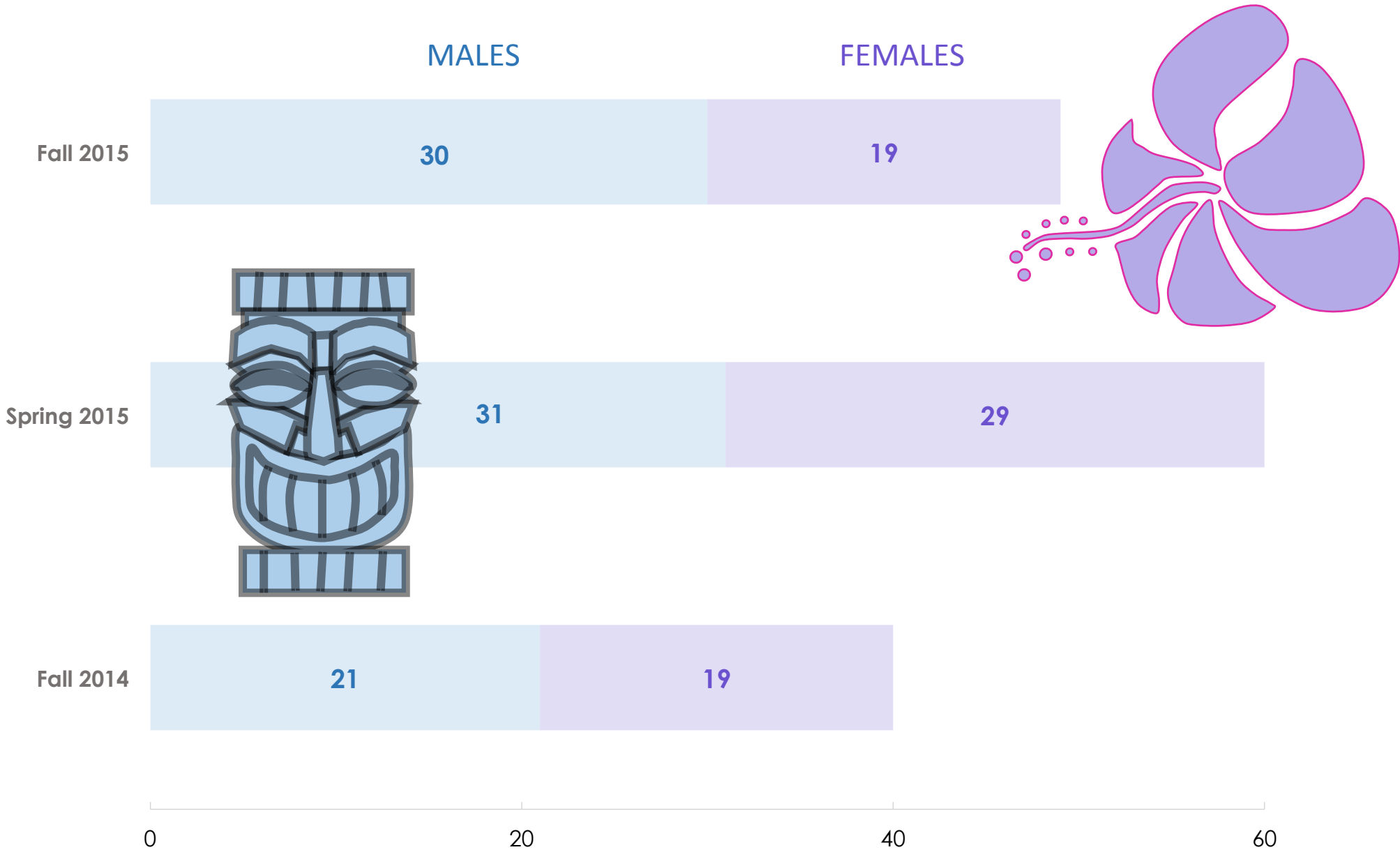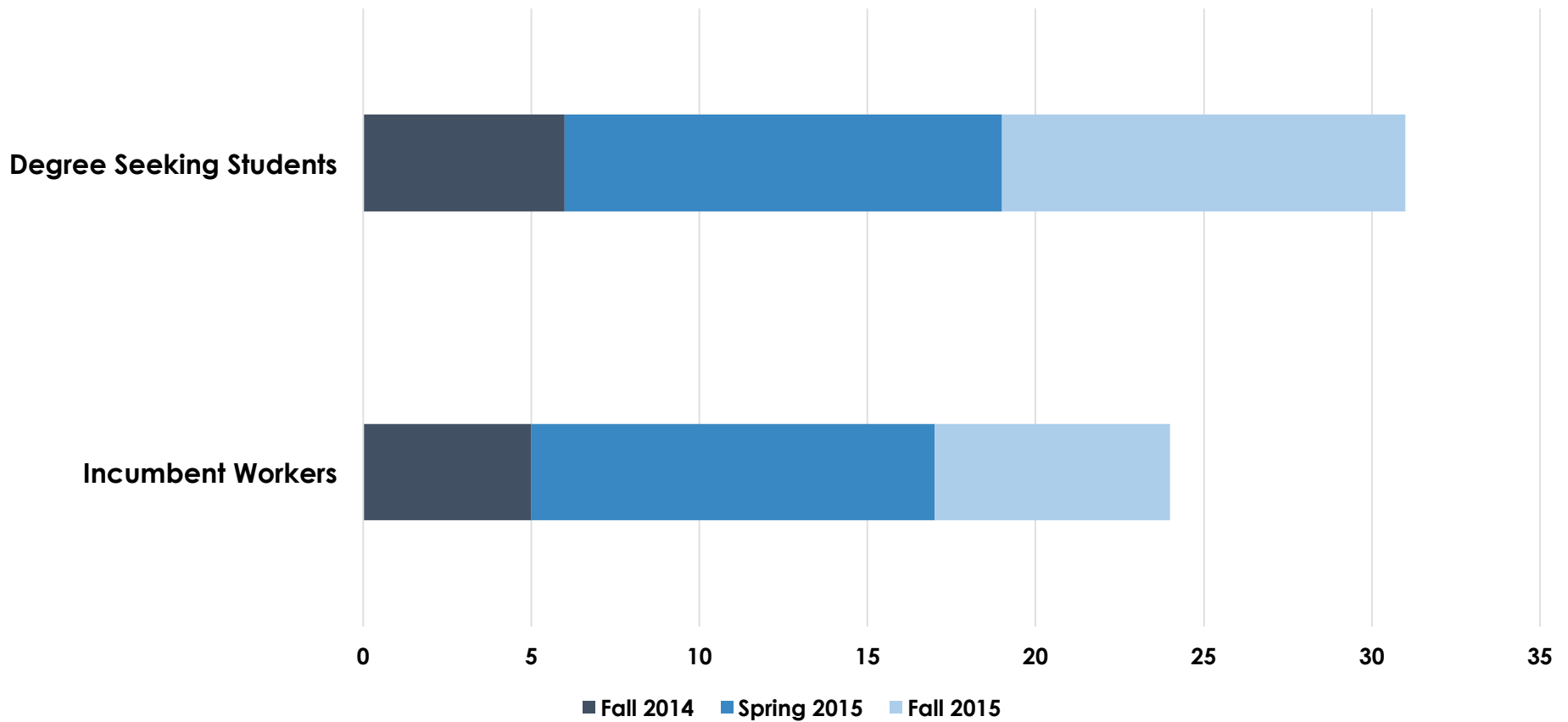- Sustainable Science Management (SSM)
- Unclassified

## Going Forward

> Evaluate student demand for GIS as a possible natural science elective for related pathways including Business Careers, Business Technology, ECET and SSM
> Evaluate opportunity to promote Natural Science degree and stacking GIS certificate
> Understand reasons for low enrollment in Agriculture (2) and Cultural & Natural Resource Management (1) as certificate resides in Ag program

*Architectural Eng & CAD Tech is an HCC Major. GIS 150 and 180 were offered there only during the Fall 2014 and Spring 2015 semesters.*

# DIVERSE MAJORS CONTINUE IN GIS 180



**High Enrollments:**

**Business Careers** (5)    **Liberal Arts** (9)    Mostly incumbent workers are **Unclassified** (28)

**SSM** (5)

**Fall 2015**
22 students
1 | 1 | 3 | 1 | 3 | 1 | 3 | 9

**Spring 2015**
29 students
1 | 2 | 2 | 1 | 5 | 3 | 2 | 13

**Fall 2014**
16 students
4 | 1 | 3 | 1 | 1 | 6

**Agriculture students completed Certificate** (1st time ever!)

Legend:
- Accounting
- Agriculture
- Architectural Eng & CAD Tech (HCC)*
- Business Careers
- Cultural & Natrl Resource Mgt
- Electronics & Comp Engin Tech (ECET)
- Engineering Tech
- Liberal Arts
- Natural Science
- Sustainable Science Management
- Unclassified

## Going Forward

> Evaluate student demand for GIS as a possible natural science elective for related pathways including Business Careers, Business Technology, ECET and SSM

> Target students who began in 150 and did not yet complete the certificate

> Continue to market to incumbent workers and Liberal Arts majors to fill classes

*Architectural Eng & CAD Tech is an HCC Major. GIS 150 and 180 were offered there only during the Fall 2014 and Spring 2015 semesters.*

# GIS ATTRACTS FEMALES TO STEM

|  | MALES | FEMALES |
|---|---|---|
| Fall 2015 | 30 | 19 |
| Spring 2015 | 31 | 29 |
| Fall 2014 | 21 | 19 |

0          20          40          60
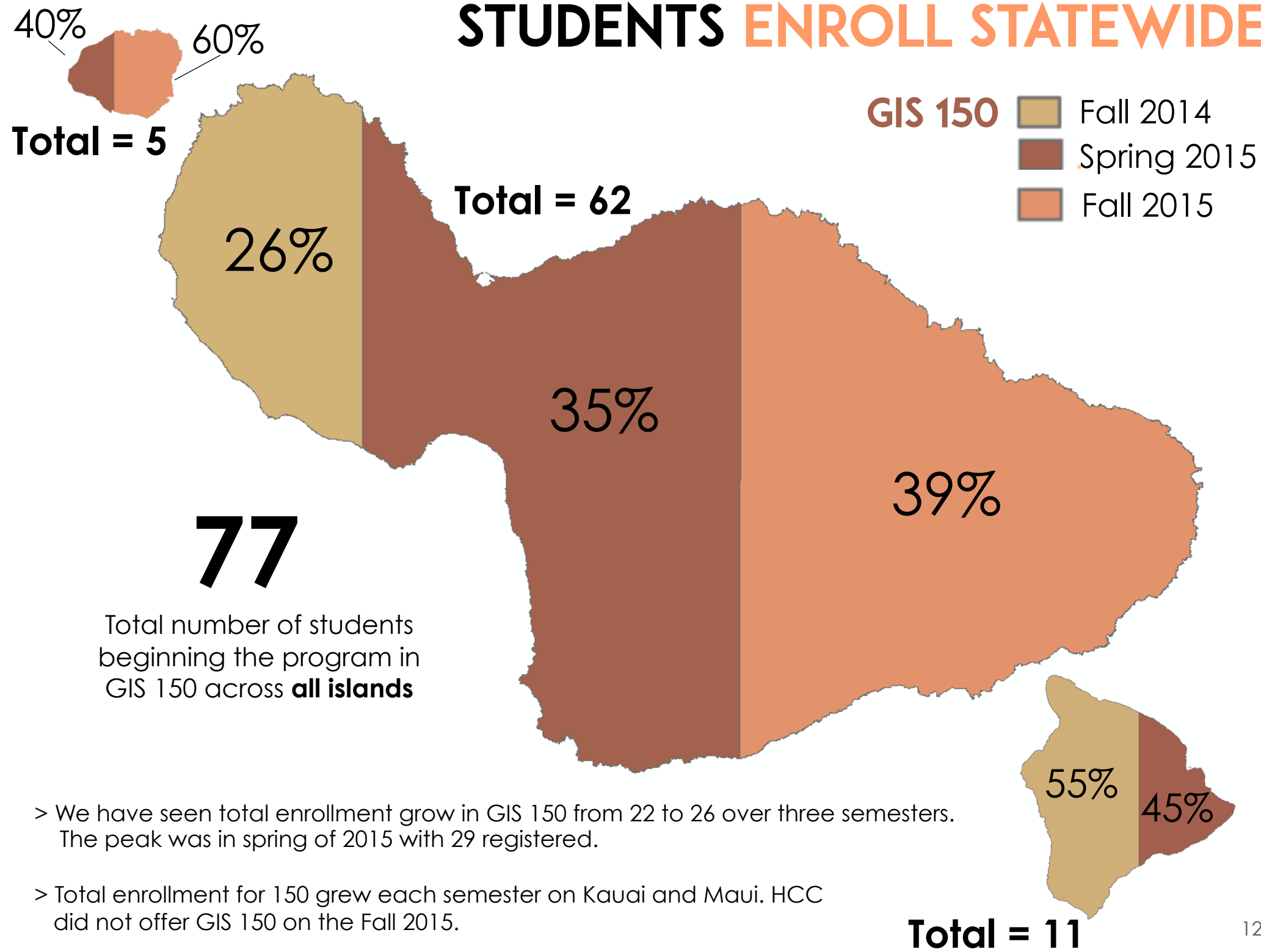
# INCUMBENT WORKERS RETURN TO COLLEGE FOR GIS



> Targeted marketing to attract incumbent workers grew registrations
> Student word-of-mouth has also helped to grow the program
> The Counseling Department has also helped to advise students on the value of the certificate within their degree pathways
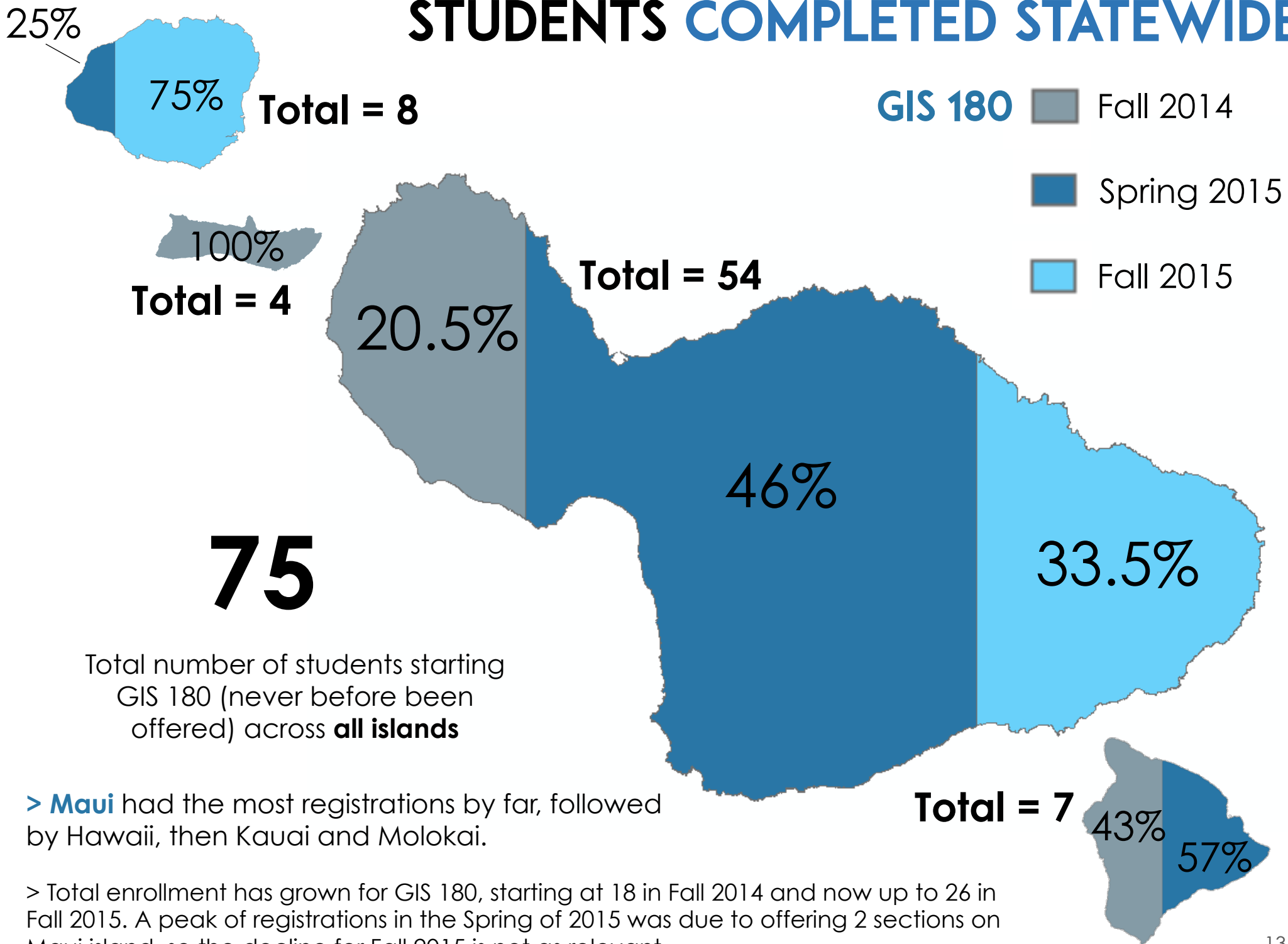
# STUDENTS ENROLL STATEWIDE

40%  60%

**Total = 5**

**GIS 150**

- Fall 2014
- Spring 2015
- Fall 2015

**Total = 62**

26%

35%

39%

**77**

Total number of students beginning the program in GIS 150 across **all islands**

55%  45%

> We have seen total enrollment grow in GIS 150 from 22 to 26 over three semesters. The peak was in spring of 2015 with 29 registered.

> Total enrollment for 150 grew each semester on Kauai and Maui. HCC did not offer GIS 150 on the Fall 2015.

**Total = 11**

# STUDENTS COMPLETED STATEWIDE

25%
75% **Total = 8**

**GIS 180**

Fall 2014

Spring 2015

Fall 2015

100%
**Total = 4**

**Total = 54**

20.5%

46%

33.5%

**75**

Total number of students starting GIS 180 (never before been offered) across **all islands**

**Total = 7**

43%

57%

> **Maui** had the most registrations by far, followed by Hawaii, then Kauai and Molokai.

> Total enrollment has grown for GIS 180, starting at 18 in Fall 2014 and now up to 26 in Fall 2015. A peak of registrations in the Spring of 2015 was due to offering 2 sections on Maui island, so the decline for Fall 2015 is not as relevant.

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# Environmental

**Fall 2015**
**Overland Flow as Potential Land Disposal at the Umatac-Merizo Wastewater Treatment Plant, Southern Guam**
by Irina Constantinescu

**Maui's Coqui Frog Invasion**
by Kyle Nagata

**Ironwood Control On Waihee Coastal Dunes**
by Karen Pollard

**Using Automated Acoustic Monitors to Detect Breeding Hawaiian Seabirds in Remote East Maui**
by Kimberly Ramos

**The Range of Educational Outreach Obtained by Conservation Organizations**
by Michelle Smith

**The Exceptional Trees of Maui County**
by Patricia Tratebas

**Spring 2015**
**Kahoʻolawe Mice Bloom**
by Jon Brito

**Potential Kiwikiu Habitat on Leeward Haleakala**
by Keith Burnett

**Kula Forest Fire: Past Lessons, Future Preventions**
by Kevin Cooney

**Georeferencing to Unlock the Potential of Aerial Images to Inform Natural Resource Management**
by Merrill Kaufman

**Human Impact on Maui's Forest**
by Destina Kittiel

**Native Tree Snails on Maui: A Snapshot of Current Population**
by Matt Padgett

**Invasive Species and Our Waterways**
by Katie Paradiso

**Native Plant Inventory**
by Palani Santos

# Agriculture

**Fall 2015**
**The Mark of Cane: Evaluating The Environmental Conditions of HC&S's Experimental Variety Test Plots Using GIS**
by Michael Ross

**Mapping of Air Quality Related Complaints on Maui**
by William Wong

**Spring 2015**

**CANE & ABLE: Conditions Determine What is Able to be Planted After the Cane Dissolves**
by Marti Buckner

**Maui Food Forests and Urban Community Farms: Eat Local and Be Self-Sufficient**
by Hali Davis-Sherwood

**Shrimp Farms in Maui**
by Judson Laird

**Conservation and Stewardship Farming Practices: Using GIS in Precision Agriculture**
by Elmer Obere

**Use of Geospatial Mapping to Monitor Holistic Farm Practices and Soil Building Techniques**
by Bena Pegg

**Strategic Placement of Farmers Markets, Maui**
by Luke Vorous

# Energy

**Fall 2015**
Photovoltaic Value Across Maui
by Wesley Hayashi

Powering Maui with PV Solar
by Javin Leal

**Spring 2015**
Hawaiian Commercial & Sugar Company: Energy Efficiency
by Naea Kalehuawehe & Heather Kotok

# Culture and Society

**Fall 2015**
**Identifying the Area with the Greatest Need for a New Public School**
by Dutch Akana

**Adding Recycling Options on the West Side of Maui for a Brighter Future**
by Adrian Teanglum

**Central Maui Landfill**
by Val Vasconcellos

**Spring 2015**

Maui Archaeology: GIS in Action in Honokowai Valley
by Jenny Pickett

**Creating a Historic Preservation GIS**
by Tina Rothman

Saving Kahoʻolawe
by Brandon Speelman

# Water and Oceans

**Fall 2015**
Analysis of Water Contamination in Aquifers of Maui
by Alvin Brazley

**Spring 2015**
Focus on the Flow
by Elisse Deleissegues

Polanui Hiu Project Area
by Jared Welch

Shoreline Environmental Water Quality in South Maui
by Jenne Shimko

# STUDENTS SUCCEED IN COMPLETING THE CERTIFICATE

**66**
Students who intended to achieve the certificate and finished

**89%**
Overall Completion Rate of Intended Certificate Students

**14%**
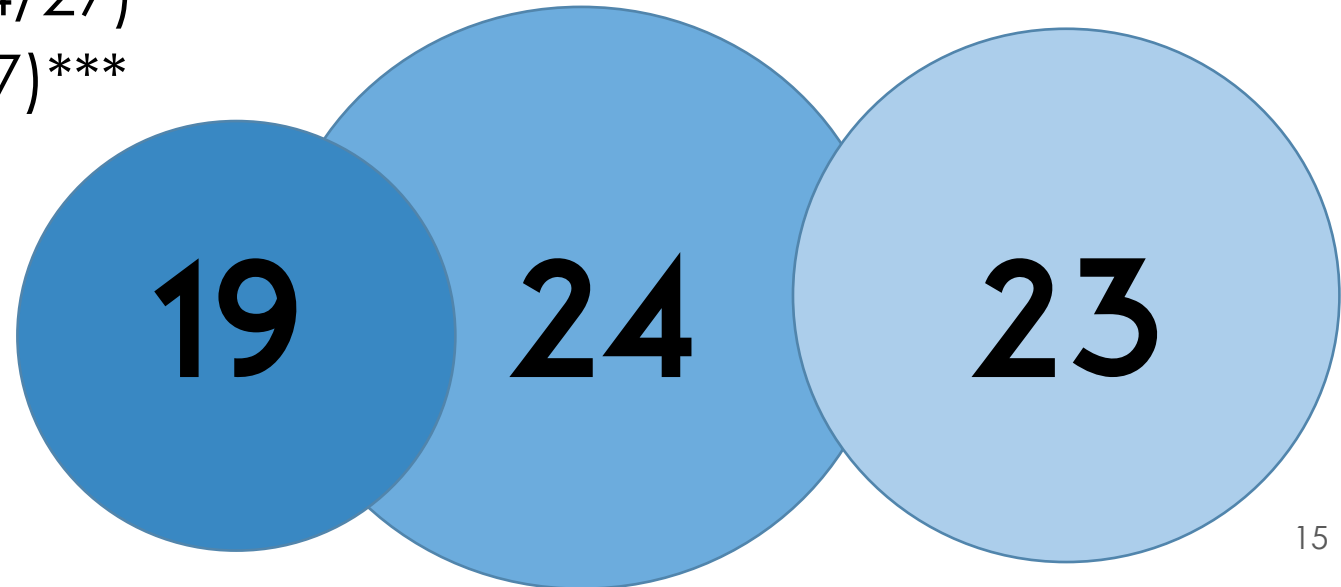Students who passed 150 and need 180 to complete the Certificate

**4**
Molokai students were awarded the Certificate in Fall 2014

## % Certificate completion rate
Fall 2014:  95% (19/20)*
Spring 2015:  89% (24/27)**
Fall 2015:  85% (23/27)***

# # OF STUDENTS COMPLETED

**19**  **24**  **23**

\* 1 incomplete – did not finish
\*\* 1 incomplete – finished in Aug 2015
\*\*3 incompletes finishing in March 2016

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# FACULTY AND STUDENTS RECOGNIZE THE VALUE OF GIS

## Ferdouz Cochran, PhD

*UHMC Faculty, Sustainable Science Management*



"GIS is an essential tool for **sustainability** science, planning and management. SSM students with experience in GIS can conduct applied studies for environmental health assessments, water budget models in water resource management, quantification of ecosystem services, evaluation of scenarios for ecosystem resilience, and land use planning for climate change mitigation and adaptation.

With the growing number of jobs in industry, government, and the private sector, GIS could truly be a Guaranteed Income Source for SSM graduates."

## Bryan Teanglum

*UHMC Electronic & Computer Engineering Technology Major, GIS Cohort Fall 2015*



"I've learned many skills that will help me think in terms of data-management and spatial analysis. GIS has given me awareness to take everyday trends and create models that will help me make informative decisions.

I believe given the exposure, GIS will surely take off and will allow high school students and current UH Maui College students to pursue degrees which will allow them to participate and learn from a subject that ties in computer, thinking, math, and geographic skills.

GIS is only in its infancy, and will give local people like myself the chance to grow in this emerging field."

# GIS SKILLS ARE IN DEMAND WITH LOCAL EMPLOYERS

## Joe Breman, IUE

*Founder/President*

" GIS is a growing industry, and as Information Technology gains importance, so will this field. A good GIS program like the one at UH Maui trains students to enter the working world with some valuable skills.
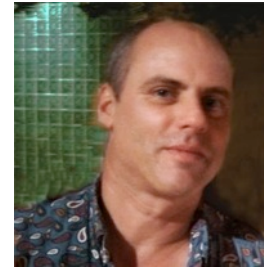
It was good to hire people from the GIS program and we will continue to do so, as they have added value, have some experience, and a good attitude and appreciation for the work. "



*Left to right: Joe Breman, UHMC GIS alumni Jordan Moore and Dwight Baldwin, and Jorma Rodieck.*

## Craig Clouet, Esri

*Solutions Engineer, Software Development*



" A world of opportunity awaits people developing skills in GIS. Many jobs use GIS extensively, and Esri supports that Maui College has been so proactive in educating and promoting GIS to their students. Students leaving the program with these abilities can go anywhere to meet the needs of both existing jobs, and those not yet invented. "

## Ray Shirkhodai, Pacific Disaster Center

*Executive Director*



" GIS is an integral part of the technologies employed at PDC for disaster risk reduction. "

# GIS OFFERS DIVERSE LOCAL JOB OPPORTUNITIES

**29%** of total certificate graduates have secured new jobs after completion

# EMPLOYERS WHO HAVE ENGAGED DIRECTLY WITH OUR STUDENTS
(Bolded companies worked on projects with students)

## Environmental
**East Maui Watershed Partnership**
**Hawaii Islands Land Trust**
**Kauai Nui Kuapapa**
**Kauai Surfrider Foundation**
**Malama Hulei`a**
**Malama Kauai**
**Malama Maui Nui**
**Maui Bird Conservation Center**
Maui Conservation Alliance
**Maui Forest Bird Recovery Project**
**Maui Green and Beautiful**
**Maui Invasive Species Committee**
Maui Nui Botanical Gardens
Maui Nui Marine Resource Council
**Maui Nui Seabird Recovery Project**
National Tropical Botanical Gardens
**Ocean Conservancy**
**Opihi Project**
**Polanui Hiu Community Managed Makai Area (CMMA)**
Pono Project
Pu'u Kukui Preserve
Resource Mapping Hawaii
**Surfrider Foundation**
**The Nature Conservancy**
Waipa Foundation
West Maui Ridge 2 Reef Initiative
**West Maui Mountains Watershed Partnership**
2015 Hawaii Conservation Conference in Hilo

## Non-Profit
Lihue Rotary
Maui Economic Development Board
**Maui Tomorrow**

## Tourism
Ali'i Nui
Erik Burton
Leina'ala Condos

## Real Estate & Architecture
**Alexander & Baldwin**
Areus Architecture
Nishikawa Architects
Pulama Lanai

## Arts and Culture
MACC
**Maui Cultural Lands**
Maui Makers
SCS Archaeology

Other: Madhuroshi, MD; Shepherd Veterinary Clinic

## Government
County of Maui: **GIS**, **Parks and Rec**, Transportation, Finance and **Environmental Management**
**DLNR – DAR & Forestry/Wildlife**
**Guam Waterworks Authority**
Haleakala National Park
**Hawaii County**
**Hawaii island Civil Defense**
**Kahoolawe Island Reserve Commission**
Kauai County
**Maui County Arborist Committee**
**Natural Resource Conservation Service**
NOAA & HIHWNMS
**State Historic Preservation Division**
**US Geological Survey**

## Education
GeoTech Center (San Diego)
**HCC -Palamanui**
**Hui Kapehe Intern Program**
**INNOVATE Hawaii**
Kalama Intermediate School
Kihei Charter School
Kula Elementary
Maui Ocean Center
National Geographic
Pacific Whale Foundation
Research Corporation of UH
Scripps Institution of Oceanography
**State of Hawaii – Dept of Education**
**Sustainable Living Institute of Maui**
UH Hilo
UH Manoa – Dept of Oceanography

## Computer/Technology
Ardent MC
Blue Sky Aerial Solutions
**ESRI**
HIS
Integrity Applications, Inc.
Koa IT
NKO.org
Oceanit
Pacific Disaster Center
Stratiatia/2C4 Tech

## Consulting
**Brown and Caldwell**
**Coastal Planners LLC**
**DLB and Associates**
**Honua Consulting**
Maui Venture Consulting
Roth Ecological Design
Weiss Associates

## Media
Maui Huilau Foundation
Maui News
Maui No Ka Oi Magazine
Mauinow.com
Maui Time

## Agriculture
**HC&S**
**Monsanto**
**Hoku Nui**

## Food & Beverage
Maui Brewing Co.
Cow Pig Bun

Energy: **MECO**; Auwahi Wind

# EVALUATE CURRENT DEGREE PATHWAYS TO GIS

| PROGRAM | GIS 150 | GIS 180 |
|---|---|---|
| **Agriculture & Natural Resources** (GIS in Ecosystem Management CO) | (4 credits) | (4 credits) |
| **Agriculture & Natural Resources** (Horticulture & Landscape AAS) | (4 credits) | **No credit towards degree** |
| **Business Careers** (AAS) | **No credit towards degree** | **No credit towards degree** |
| **Business Technology** (AAS) | **No credit towards degree** | **No credit towards degree** |
| **Electronic & Computer Engineering Technology** (AS) | **No credit towards degree** | **No credit towards degree** |
| **Human Services** (AS) | **No credit towards degree** | **No credit towards degree** |
| **Liberal Arts*** | Elective (4 credits) | Elective (4 credits) |
| **Natural Science** (AS) | Biological or Physical Science Concentration Elective (4 credits) | Biological or Physical Science Concentration Elective (4 credits) |
| **Sustainable Science Management** (BAS) | Lower Division (4 credits) | **No credit towards degree** |

Source: 2015-16 General Catalog
* Not currently listed in General Catalog, but confirmed by UHMC Counseling Dept.

# IDEAS FOR SCALING AND SUSTAINING GIS AT UHMC

The Transformative Change Initiative at the College of Education at the University of Illinois has developed **eight guiding principles** to assist community colleges in achieving transformative changes and successfully scale, spread and sustain innovations in education. Following are some initial ideas to apply these guiding principles to potentially scale and sustain the existing GIS Certificate at UH Maui College.

## 1 Leadership through Collaboration

> Leadership by a faculty champion to evaluate the diverse needs and multidisciplinary interests of students and community in field of GIS.

> Collaborative effort among STEM, Humanities, and Social Sciences departments, and the Office of Continuing Education, to support the development of credit and non-credit pathways, and provide equitable opportunities for all students and respond to workforce and community needs for GIS.

## 2 Adoption and Adaptation

> Commitment to adoption, adaptation, measuring, learning and quality improvement process.

> Assess curriculum, resources and community need to address multidisciplinary scaling and program sustainability.

## 3 Evidence

> Examine lessons learned and best practices from grant innovations.

> Leverage and analyze existing data from weekly student surveys, employer engagement database, and quarterly reports.

## 4 Storytelling

> Information sharing through student, faculty and employer perspectives and outcomes through multimedia (print, web, video, f2f) supports student enrollment.

> Continue use of blog, enewsletter and social media tools.

## 5 Networks

> Continue engagement with the employers already participating and to encourage more of their employees to take the certificate.

> Extend network to new disciplines (e.g. Human Services, Transportation, and Healthcare) to gain access to expertise, professional development, and new resources.

## 6 Dissemination

> Leverage existing network of employers, instructors and alumni to share knowledge and promote local opportunities for employment, internships, and continuing education.

## 7 Technology

> Invest in maintenance, support and new technologies to strengthen resources and expertise.

> Laptop lender program has potential to use technology to promote GIS certificate and strengthen network.

## 8 Spread & Endurance

> Evaluate evidence and opportunities to scale GIS courses to other multidisciplinary programs with potential to spread and endure.

*Source: Transformative Change Initiative*

# APPENDIX

## A. Companies Interested in Part-time Hires and Project Interns

**Requested Interns:** 2c4 Tech, PacIOOS, DLNR – DAR & DOFAW, Roth Ecological, Maui Invasive Species Committee, Maui Forest Bird Recovery project, MSP, Akimeka, and The Nature Conservancy.

**Other maybes:** Apollo, NOAA, West Maui Mountain Watershed Parternship, MHPCC, GeoINTcom, OceanIT, Department of Health, County of Maui, Hawaiian Island Land Trust, Maui Police Department, Pacific GPS, and MECO.

At this time, we have not followed up with these companies and no internships exist yet (except for MFBRP). This is a gap that SLIM is trying to address with a new NSF grant.

## B. GIS Mentorship Program
Encourage previous students to join the Geo-Mentor program: http://www.geomentors.net/

## C. Technology Notes

**Hardware and Software Management and Maintenance**
* 20 Student laptops to be maintained and updated (Sarah currently does this – <u>not</u> maintained by UHMC IT). GIS graduate/ECET major/OCET student help Dutch Akana possible candidate for IT support?
* GIS software changes so rapidly that each semester it needs to be updated to newest version – download and installation can take up to an hour per computer.
* 20 GPS units (10 Trimble and 14 Garmin handheld GPS receivers) – need to be maintained – data cleaned off from previous semesters, updates completed and batteries charged.

**GIS Software License:**
* For student software on laptops: Cheaper to go directly to ESRI (30 lab pack=$1,000, annual maintenance fee at $250). Make sure version is up to date with curriculum.
* Student personal licenses: Requested each semester from ESRI (free 1 year trial) and maintained by Sarah.
* GPS software: 10 licenses of Pathfinder office – need to be upgraded, and DNR GPS software.

**Loan Program:**
Advertise our hardware sharing programs: laptop loaner program and handheld GPS use for projects.

## D. Employer Survey, Spring 2014

We conducted a survey at the beginning of our certificate offering. 29 local companies responded, representing over 1500 employees. The results included:

Target those who need jobs: local companies want to hire 50+ FT, 35 PT and 21 seasonal employees with GIS skills in the next 5 years.

**126** employees <u>already employed with these companies</u> need training in GIS. To date – there is no record that any of these 126 people have registered for the courses.

The biggest challenges to implementing a GIS at a company are time and cost. However technology is changing quickly and costs are going down significantly – market to the industry and those who want a GIS but don't know yet how to implement.

## E. Survey Results of Student Interest in New Courses

23 graduates participated in a survey at the end of the GIS 180 course. They indicated they are interested in new courses in these topics:

| | |
|---|---|
| **Advanced GIS** | **57%** |
| **GIS Programming** | **35%** |
| **GIS Modeling** | **35%** |
| GIS Analysis Techniques | 30% |
| World Geography | 30% |
| Advanced GPS | 26% |

# F. Address Registration Challenges

The GIS classes are not easy to register for. Right now they are 8 weeks a piece, which isn't entirely clear in either Banner or Laulima.

<u>**Barriers include**</u>:

1) About half of our students are NOT traditional students and are coming in from industry to only take these courses. Going through the admissions process is a bit of a barrier for these types of students. As of end of Fall 2015, 48 students signed up for these courses as <u>new</u> students – not having taken another course here at UHMC.

2) Pre-reqs: These are a good thing but they are waived for almost every student. The reason is that most are non-traditional and joining us only for these courses. Because we can waive them it's not so bad but it is another step that the student has to wait on for the instructor to do.

3) 180 Pre-req: Students are registering for 180 at the same time as 150 so I have to waive the pre-req for all of them. I don't know if there is a way around this but it is something to bring up.

We created a guide to registration specifically for these classes which could be better used by counseling and the registrar's office.

# G. Explore Service Learning Opportunities

Develop opportunities to earn course credit for community service using GeoTech skills (e.g. providing GIS services to a local NGO, flying UAV's to show environmental degradation, creating databases of volunteers).

# H. Enhance Student Support Services

**PLA**
GIS 150 PLA was the first test-out option for a course at UHMC. It has been useful in getting those with some entry-level experience to complete the certificate.

**Tutoring**
Provide for tutors at TLC and others who have already taken the GIS certificate program

**Test Prep**
Offer test prep for Industry certificates (ex. ESRI entry-level certificate)

**Tech Support**
Provide services for IT help here on campus to make software license downloading easier. Downloads for this specific software can be complicated.

# I. Industry Standard Competencies

Department of Labor competency model:
http://www.careeronestop.org/CompetencyModel/competency-models/geospatial-technology.aspx

Esri Certification:
http://www.esri.com/training/main/certification

# J. Transformative Change Initiative

Learn more here:
http://occrl.illinois.edu/projects/tci/