

The Geography of GIS Education in the United States

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Abstract

The long-term sustainable growth of the U.S. GIS&T community (or the geospatial industry) relies upon the development of a diverse, multi-faceted GIS educational system. In the U.S., there are almost 400 academic programs offering GIS education and training. These programs offer stand-alone GIS courses, undergraduate and graduate degrees, as well as professional certificates. Some are offered through traditional methods while others are delivered through distance learning programs. This paper attempts to provide a comprehensive look at how these programs vary across the U.S. For examples, how accessible are these educational and training programs to urban versus rural population? Is there a spatial “mis-match” between the supply of GIS education and demand of GIS-training workforces in the U.S.? How are different academic disciplines, such as Geography, approach the tremendous needs to deliver quality GIS education? The main objective is to provide a base-line understanding of the state of the U.S. GIS education.

Objectives:

- Provide an overview of the “geography” of GIS education in the U.S. Producing a base-line database of existing/known GIS educational programs.
- Examine the diversity of these programs.
- Assess accessibility of GIS education using very simple measures (simply based upon Euclidean Distance, acknowledging the limitations of the approach).
- Provide basic evaluation how “spatial” access to GIS education differs for minority population.
- Encourage other GIS education programs to enhance the database and therefore facilitate collaborations in GIS curriculum development at all levels.

Data and Methods

- AAG's Guide to Geography Programs in the Americas;
 - <http://www.aag.org/Careers/>
- URISA, UCGIS, and ESRI online database;
 - <http://www.urisa.org/career/colleges>
 - <http://www.ucgis.org/Membership/membersall.asp>
 - <http://gis2.esri.com/university/onlinedb.cfm>

- Manual identification (online) of the level of education provided at each program
 - PhD, MA/MS/MBA/MPH, Professional Certificate, Graduate Certificate, BA/BS, AS/AAS, Minors/Concentration, Individual Courses
- Address of academic institutes obtained from U.S. Department of Education Integrated Postsecondary Education Data System (IPEDS)
- Gecoding addresses (ESRI StreetMap USA)
- Compare to Census Data (2000 census)
 - Total Population, White, Non-white, Hispanic, Female

Results and Discussions

- 466 academic institutes (excluding for-profit organizations) have been identified;
- 194 institutes offer individual courses that do not culminate in any formal qualification;
- 193 programs offer “minors” or “concentration”;
- 172 programs offer certificates at various levels;

- Formal Degrees:
 - AS/AAS: 24
 - BA/BS: 42
 - MA/MS/MBA/MPH: 33
 - PhD: 5
- “Geo” (especially, geography) remains the most frequent academic home of the GIS education programs.
- Every U.S. states and D.C. have at least 1 academic institute offering GIS education. There is considerable spatial variability in their locations.

GIS Education Programs by Type

GENERAL TYPE	NO. OF PROGRAMS
COURSES	194
FORMAL	272
AS/AAS	24
BA/BS	42
MINORS	61
CONCENTRATION	132
MA/MS/MBA/MPH	33
PHD	5
CERTIFICATE	116
PROFESSIONAL CERTIFICATE	16
GRADUATE CERTIFICATE	40
TOTAL	466

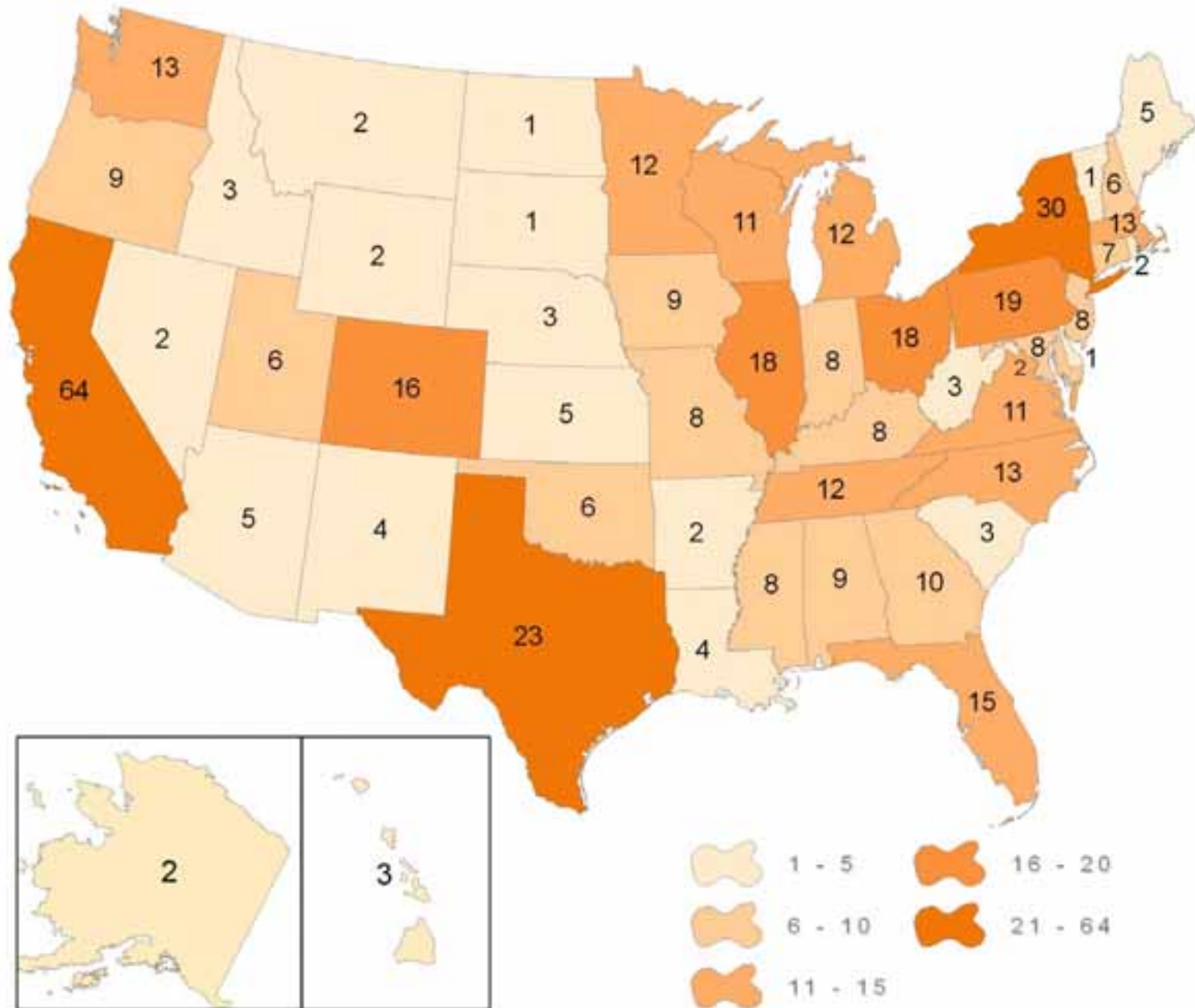
Program Names/Academic Homes

- Geography
- GISciences
- GIS
- Geoinformatic
- Geomatic
- Geospatial
- Earth Sciences
- Environmental Sciences/Study
- Natural Resources
- Engineering
- IT/Computer Sciences
- Planning

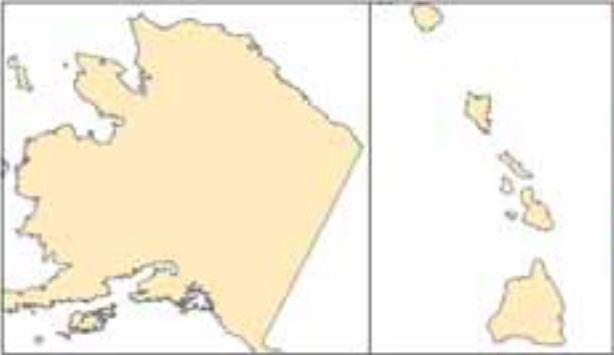
GIS Education Programs across the U.S.

GENERAL TYPE	NO. OF STATES
COURSES	44
FORMAL	50
AS/AAS	17
BA/BS	26
MINORS	31
CONCENTRATION	47
MA/MS/MBA/MPH	20
PHD	4
CERTIFICATE	38
PROFESSIONAL CERTIFICATE	13
GRADUATE CERTIFICATE	26
TOTAL	52

No. of Academic Institutions Offering Any Form of GIS Education

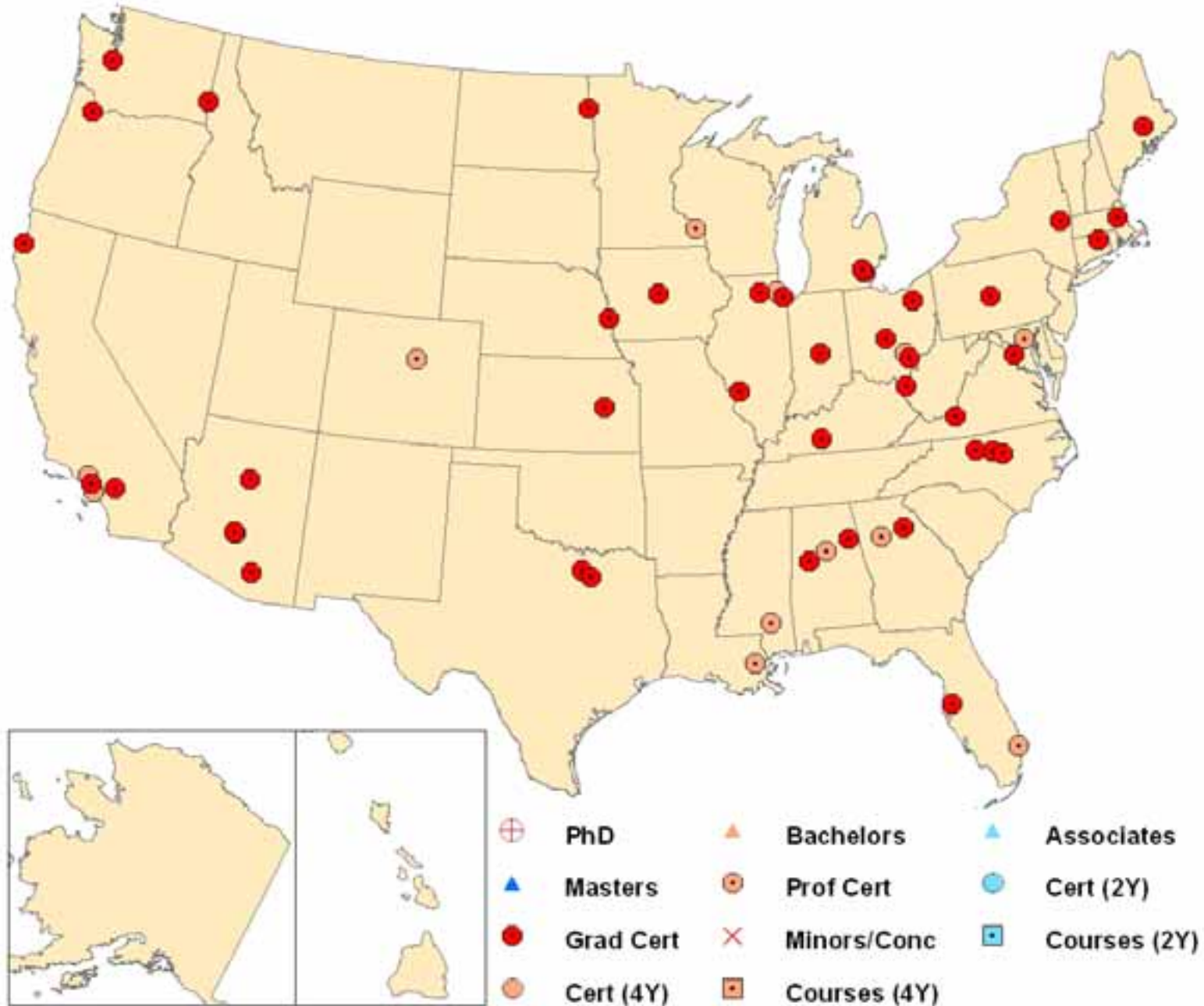


PhDs and Masters Offered in GIS

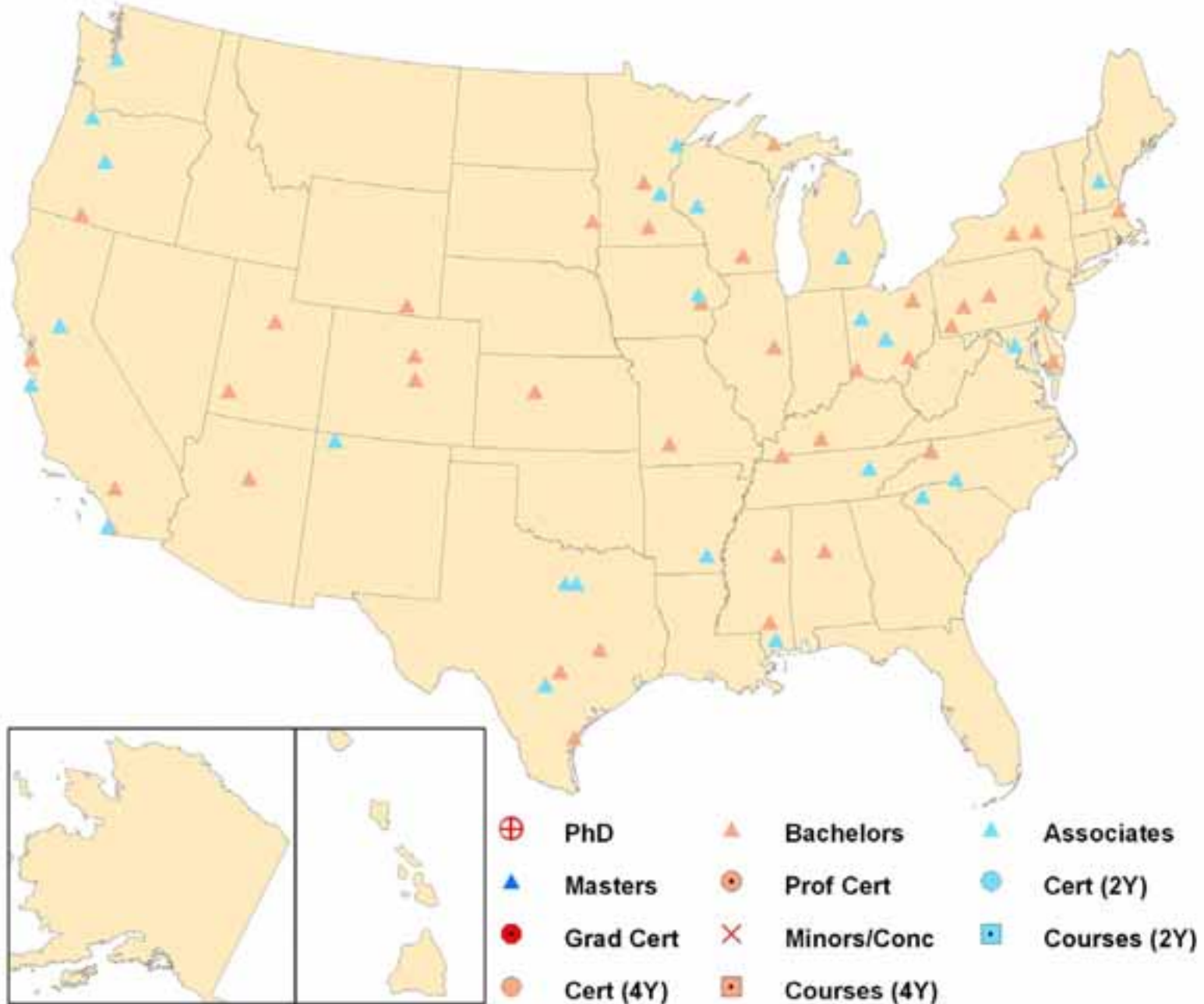


- | | | | | | |
|---|-----------|---|-------------|---|--------------|
| ⊕ | PhD | ▲ | Bachelors | ▲ | Associates |
| ▲ | Masters | ⊙ | Prof Cert | ● | Cert (2Y) |
| ● | Grad Cert | ● | Cert (4Y) | ■ | Courses (4Y) |
| | | × | Minors/Conc | ■ | Courses (2Y) |

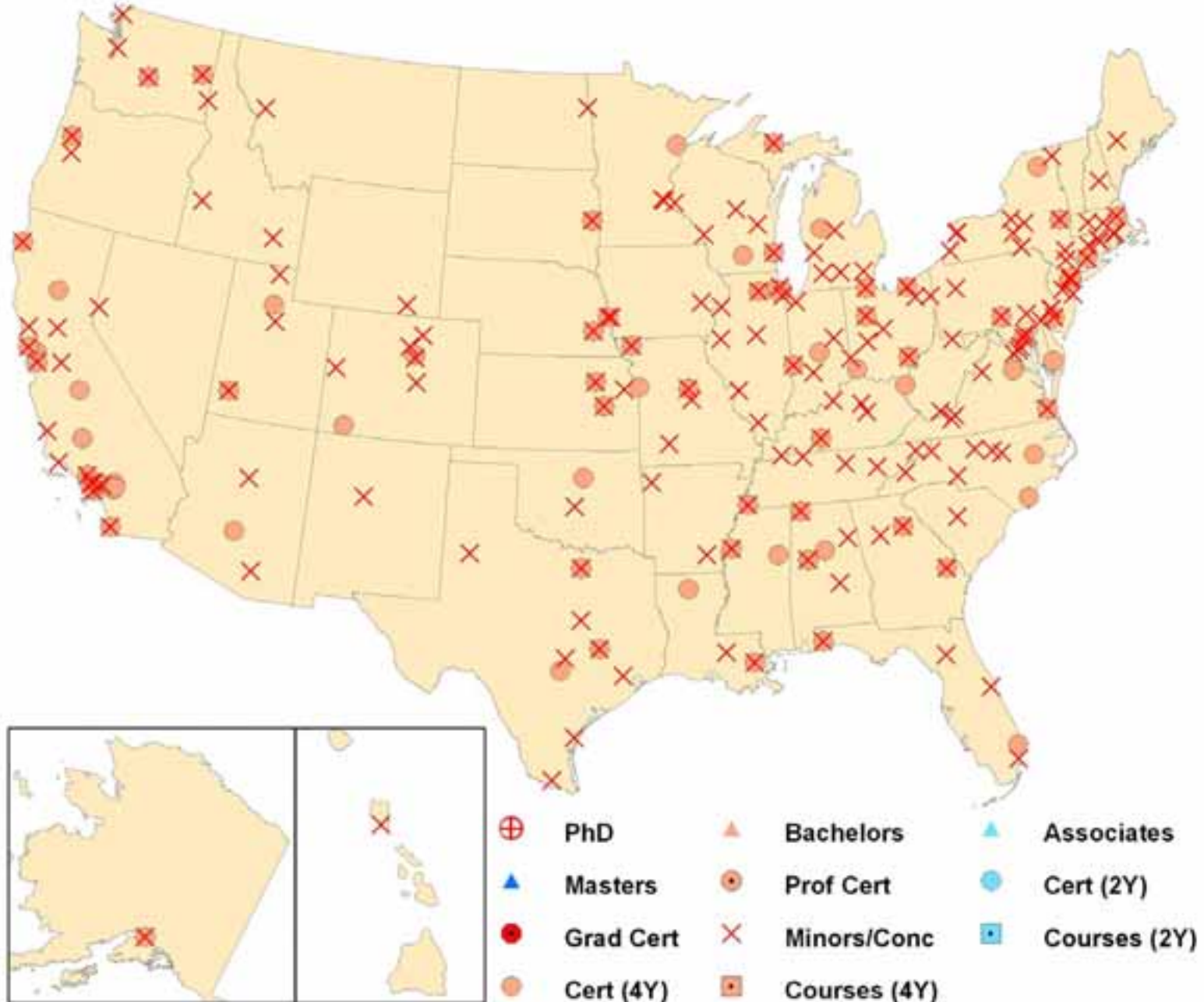
Professional and Graduate Certificates (4-Years) Offered in GIS



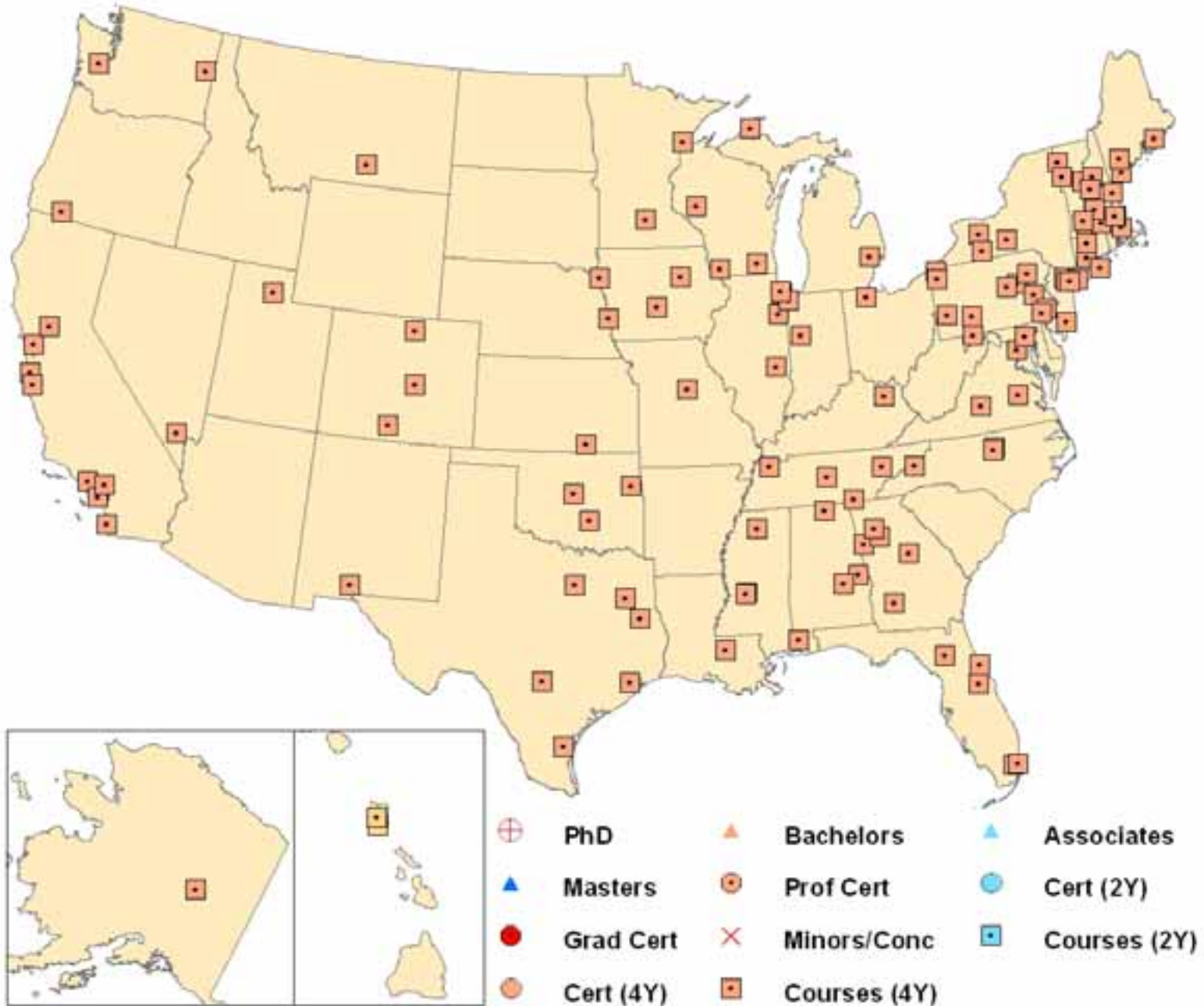
Bachelor and Associate Degrees Offered in GIS



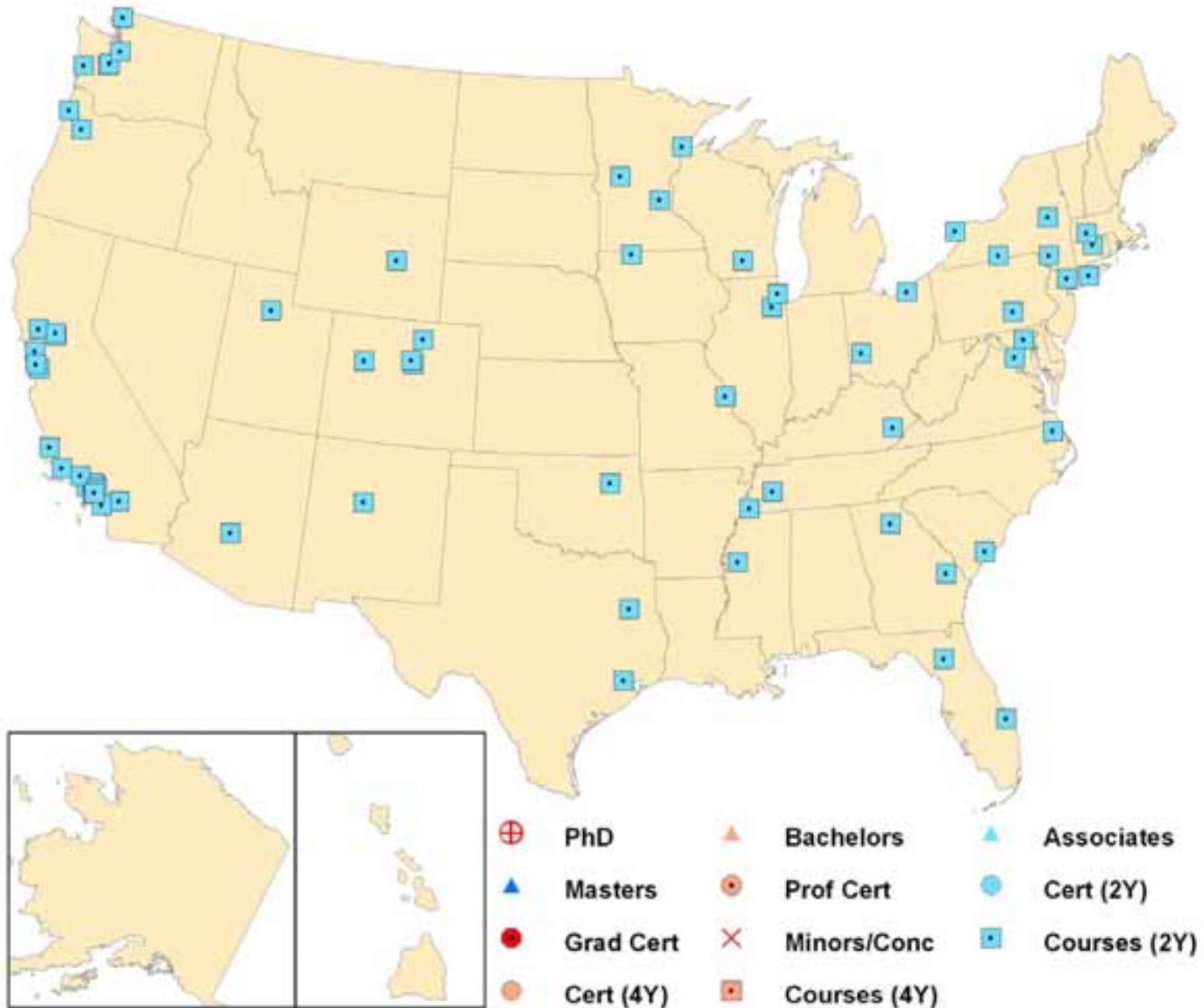
Certificates, Minors and Concentration (4-Years) Offered in GIS



Individual Courses (4-Years) Offered in GIS

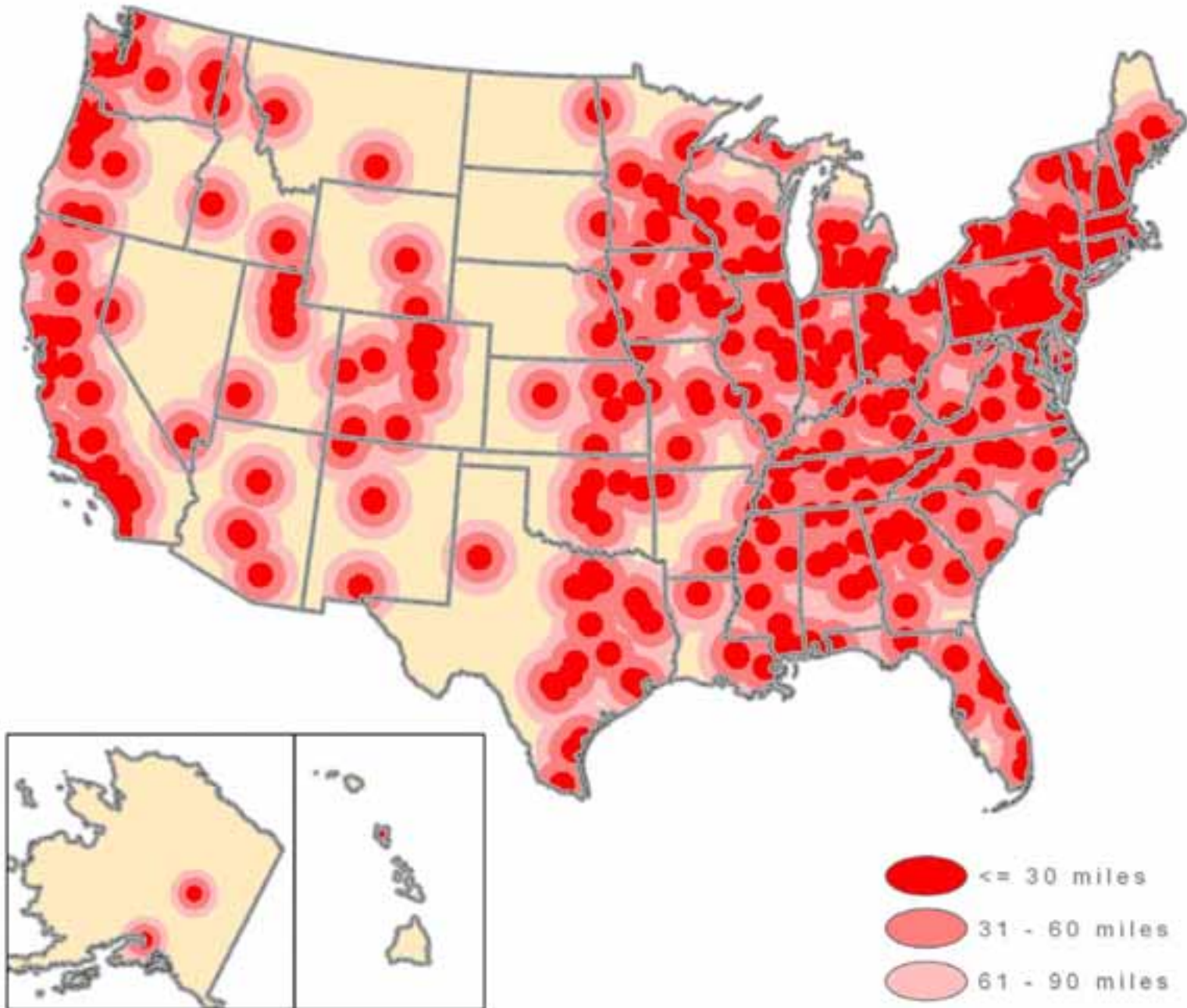


Individual Courses (2-Years) Offered in GIS



- Euclidean distance (90-miles) is used as threshold to determine the population served by each academic institute in the database.
- Population based upon the 2000 Census is used. Total population, white, non-white, and Hispanic population are counted within the distance threshold. These counts are expressed in percentage for comparison purpose.

Euclidean Distance (in Miles) from all GIS Education Programs



Population within 90 miles of GIS Education Programs
(expressed in percent total)

<u>TYPE</u>	<u>OVERALL</u>	<u>WHITE</u>	<u>NON-WHITE</u>	<u>HISPANIC</u>	<u>MALE</u>	<u>FEMALE</u>
PhD	3.4	4.1	1.3	1.2	3.5	3.4
Masters	19.7	22.8	10.5	7.9	19.9	19.6
Bachelors	21.6	24.8	11.8	11.2	21.8	21.4
Associate	14.2	15.9	8.8	7.9	14.3	14.0
Graduate Certificate	22.2	25.3	12.8	10.2	22.3	22.1
Professional Certificate	10.3	11.1	7.8	7.0	10.4	10.2
Certificate at 4-Yr Institutes	30.0	33.1	20.7	18.3	30.3	29.7
Certificate at 2-Yr Institutes	15.7	17.6	10.1	12.2	15.9	15.5
Minors or Concentration	41.9	46.6	27.4	24.0	42.2	41.5
Course only at 4-Yr Institutes	35.7	39.6	23.9	20.2	35.9	35.4
Course only at 2-Yr Institutes	24.7	27.5	16.5	14.6	25.0	24.5
Any	46.5	51.5	31.2	27.9	46.9	46.0

Some observations

- GIS Education across the United States is expanding;
- Education level varies substantially;
- Formal degrees in GIS (and its variation) are not common;
- Less formal educational offerings are more common;
- There seems to be a disparity in terms of access to GIS Education in terms of race and ethnicity;

- Reliance on “Geography” as home of GIS education is still considerable;
- Alliance with other fields is important and vital to the growth of GIS Education in the U.S.
- Online education may alleviate the gap in GIS education, especially at the graduate level.

Limitations

- All self-reporting (not a comprehensive database);
- Quantity not quality measures;
- Accessibility measured by Euclidean Distance and arbitrary 90-miles distance threshold;
- Other accessibility concerns and issues are not addressed;