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Developing an Image-based Riparian Inventory Using Nested Area Frame Sampling: A Project Summary

Project Team

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Background

Currently, there is no nationally consistent method for inventorying and characterizing riparian areas. It is generally understood that the USFS Forest Inventory and Analysis (FIA) program does not adequately sample linear, sparse and widely distributed resources, which results in underestimation and poor characterization of riparian resources across the landscape.

The objective of this project is to develop a method of inventorying sparsely distributed lotic, (i.e., running water) riparian areas. The method will:

- Be appropriate for inventorying large areas on the scale of states,
- Use the state of Wyoming as the study area,
- Focus on estimation methods that are more cost effective than sample designs that depend entirely on ground sampling,
- Be based on imagery and other geospatial data,
- Ensure that the methods are applicable throughout the western United States and the general approach can be applied nationally,
- Recognize that inventories need to be adaptable to a hierarchy of scales, methods of analysis, and uses that will help people select the right tool for the situation or analysis question,
- Be consistent, at some level, with the direction provided in the Aquatic Ecological Unit Inventory (AEUI) technical guide.

It is also important to note that the objective of this project is not a wall-to-wall delineation of riparian areas. The objective is to produce tabular estimates of riparian area by some straightforward biophysical attribute, much like FIA does for forestlands. The methods summarized here will use imagery in a multi-stage sample design.

Riparian Zone Definition

Since this project is focused on lotic riparian systems (running water systems such as streams), using a topographically-based analysis to delineate surface flow, drainage networks, and flood plains seems appropriate; however, due to the extensive computing requirements for this type of analysis, we will limit this procedure to the smaller, primary sample areas within Wyoming. Our working definition of lotic riparian zones should therefore be topographically-based (e.g., flow direction, flow accumulation, valley bottom, etc.). The classification of riparian areas within these valley bottoms use multispectral imagery, but will also include test areas that summarize our estimates by valley bottoms, or valley segments as defined by the Aquatic Ecological Unit Inventory (AEUI) technical guide. The intent of this pilot is to develop a protocol that will be consistent with, or adaptable to, any national technical direction established within the agency.

Methodology

Study Area

The state of Wyoming, defined by its political boundaries, will serve as the study area for this project.

Sample Design

This project will perform an assessment of riparian resources with a focus on imagery. The project will use a Nested Area Frame Sampling (NAFS) technique described by Koeln and Kollasch (2000). Such a technique has the potential to relatively quickly answer the ‘big’ questions and minimize the need for costly field data collection. In addition, if more detailed information is required, it will be possible to nest higher resolution imagery or field-based sampling within the structure of the multistage sample. The final page of this document contains a flowchart that outlines the procedural steps involved with the NAFS approach.

Project Management

FIA: FIA will provide the grid points for the overlay with a buffered streams layer and cooperate in an evaluation of how well the FIA grid samples riparian forests.

FHM Riparian Inventory Focus Group: FHM RIFG will provide direction, technical input and consultation and peer-review.

RSAC: RSAC will be responsible for all aspects of project management, data analysis, documentation and reporting, and technology transfer.

Deliverables

Process

The process developed must be applicable regionally and nationally, with GIS layers and remotely sensed data that are consistent and widely available nationally. It must also be consistent, at some level, with the direction described in the AEUI technical guide.

Estimates and Geospatial Analysis

- The primary objective of this project is to produce a riparian area estimate for the state of Wyoming. The estimates will be summarized by some, yet to be determined variable(s). Possible variables include: stream order (will require some research and development), elevation, forest vs. non-forest (depending on what high resolution data is available, this may or may not be possible), valley segment classes, or 5th or 6th code HUCs.
- Geospatial analysis regarding the location of FIA plots with respect to their proximity to streams. The question comes from the following resolution from the Sedona FHM meeting: “determine how many plots would have been included in these 2-dimensional strata. In addition, the stream layer, with a 200-foot buffer, will be intersected with the grid points and compared with the map strata.”

Literature Cited

Koeln, Gregory T. and R. P. Kollasch, 2000. *Crop Area Assessments Using Low, Moderate and High Resolution Imagery: A GeoTools Approach*. Earth Satellite Corporation, Rockville, MD. 12 p.

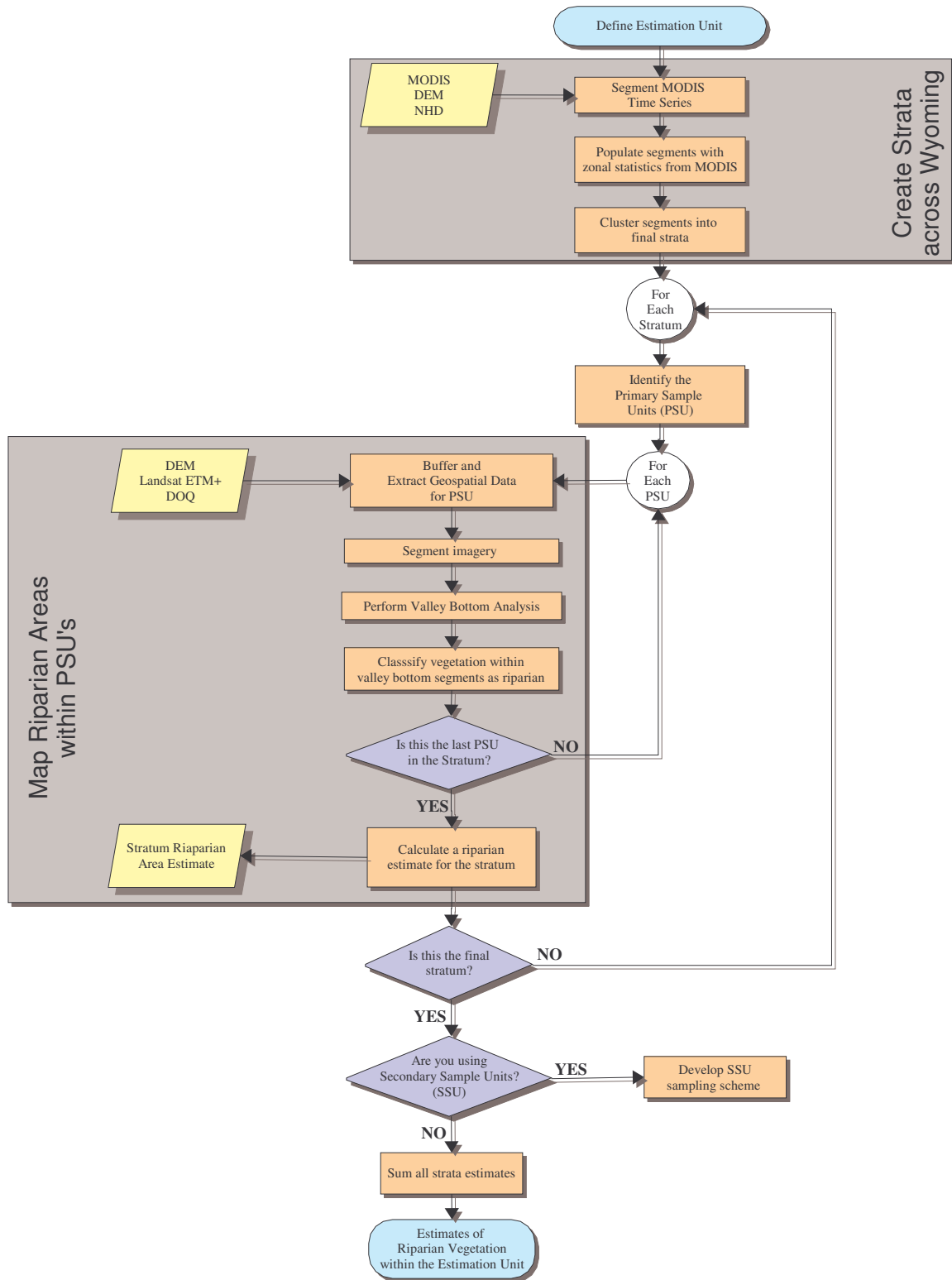


Figure 1. An analytical process flow diagram for the Wyoming multistage riparian inventory.