Ecosystem Services Assessment Tool (ESAT) Design Document Revision 2

By Shawn Prepared on July 22, 2019

# Statement of goals

The main goal is to develop an online GIS-based tool (ESAT) to 1) explore BMP on-site and off-site effectiveness and costs (exploration mode), 2) prioritize BMP type and location based on user specified conservation program objectives and constraints (optimization mode), and 3) apply to Indianfarm Creek watershed.

# Functional description

* Database design
* Transferrable to different watershed
* Support BMP extension (adding new BMP in the future for optimization)
* Spatial support
* Map display, e.g., watershed boundary, stream network, field (or Alberta Legal Subdivision, LSD) boundary, use map to show BMP effectiveness and costs etc.
* Map-user interaction, e.g., map-based selection (single and multiple selection), map-table-chart selection synchronization, map selection triggered popup etc.
* User & project
* Target user include agriculture producer and watershed manager
* Support project creation, saving, and deletion
* Exploration mode
* Show watershed characteristics in field scale, e.g., elevation, slope, land use, soil texture, hydrological results (baseline annual average and standard deviation)
* BMP effect ranking to support BMP selection
* Watershed scale BMP summary and effectiveness summary
* Optimization mode
* Specify conservation program optimization objectives and constraints
* Support customizing available BMPs in one watershed
* Support multiple constraints (e.g., reduce TP more than 20% AND carbon increase by 10%)
* Execute optimization model
* Display optimization results
* Support exporting exploration and optimization results in table format

# Interface design

See appendix-1 for interface design.

# Database design

See appendix-2 for database design

# Timeline

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| Major task | Description | Est. due date | Responsible |
| System design | Finish and agree on interface, database, and functionality design | Jul 26 (3 weeks) | Shawn,  Zhiqiang,  Wanhong,  Yongbo |
| Gully Creek test data | Prepare Gully Creek test package, i.e., database and shapefiles, for ESAT debugging and testing | Aug 2 (1 week) | Shawn |
| User & project | Develop and test user and project related functionalities, including user login, authentication, project management, and project chart mapping | Est. 2 weeks | Zhiqiang (interface),  Shawn (server) |
| Exploration mode | Develop and test exploration mode related functionalities, including watershed info display, BMP selection (map random selection and sorted chart selection), watershed summary (BMP summary, effectiveness summary) etc. | Est. 6 to 8 weeks | Zhiqiang (interface),  Shawn (server) |
| Optimization mode | Develop and test optimization mode related functionalities, including optimization setting, executing optimization model, and display optimization results etc. | Est. 6 to 8 weeks | Zhiqiang (interface),  Shawn (server) |
| IMWEBs subfield design and development | Design, development and test sub-field scale simulation in IMWEBs model | Est. 3 weeks | Yongbo (design),  Shawn (development) |
| Indianfarm Creek data preparation | Prepare Indianfarm Creek spatial files and modelling results to support user, project, exploration, and optimization functionalities in ESAT | Est. 4 weeks | Yongbo,  Shawn |
| Online test Indianfarm Creek using ESAT | Online test and debug ESAT user (phase 2), project (phase 2), exploration (phase 1 or 2), and optimization (phase 1 or 2) functionalities based on Indianfarm Creek spatial data and modelling results | Est. 3 weeks (Phase 1)  Est. 4 weeks (Phase 2) | Shawn,  Zhiqiang,  Yongbo,  Wanhong |