Outline

- An Intro to LiDAR
- The Wet Areas Mapping Concept
- Data Inputs & Outputs
- Data Visualization & Interpretation
- Data Format & Storage
- Data Usage (Office & Field)
Wet Areas Maps: An Into to LiDAR

Light Detection And Ranging
Wet Areas Maps: An Into to LiDAR

Distance = (Speed) x (Time)
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- Post-processing creates highly accurate “bare earth” Digital Elevation Models (DEMs)
Wet Areas Maps: The Concept

1. Prepare DEM Surface
Wet Areas Maps: The Concept

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2. Predict locations of potential stream channels
Wet Areas Maps: The Concept

1. Prepare DEM Surface

2. Predict locations of potential stream channels

3. Use the Wet Areas algorithms to predict potential cartographic wetness across the landscape.
Wet Areas Maps: Data Inputs

Full-Feature LiDAR:
Wet Areas Maps: Data Inputs

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- Captures trees, buildings, bridges, etc.
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-Software is used to classify LiDAR returns
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Wet Areas Maps: Data Inputs

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- Well, do we know that there is a culvert?
Wet Areas Maps: Data Inputs

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-Well, do we know that there is a culvert?

-That is why culvert data is helpful
Culvert Points:

- Algorithms are used to determine the appropriate angle and length of “virtual culvert” to breach the road.
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1. **Bare Earth LiDAR Surface**
   - High resolution DEM
   - Accurate “bare earth”

X Roads may act as artificial dams
Wet Areas Maps: Data Inputs

1. **Bare Earth LiDAR Surface**
   - High resolution DEM
   - Accurate “bare earth”
   - X Roads may act as artificial dams

2. **Mapped Culvert Data**
   - Allows for road breaching
   - Map accuracy is improved with mapped culvert data
Wet Areas Maps: Data Outputs
1. **Predicted Stream Channels**
   - intermediate output
   - used within the model to determine a basic flow network
Wet Areas Maps: Data Outputs

1. **Predicted Stream Channels**
   - Intermediate output
   - Used within the model to determine a basic flow network

2. **Predictive Wet Areas Map**
   - “Cartographic”
   - Map-based
   - Topography-driven
   - No soil data component
Wet Areas Maps: Data Visualization
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- Maps are symbolized from dark blue (more wet) to light blue (less wet)
Wet Areas Maps: Data Visualization

- Maps are symbolized from dark blue (more wet) to light blue (less wet)
- Symbology can be altered to suit user’s needs
  - different colors
  - different value ranges
Wet Areas Maps: Data Interpretation
Wet Areas Maps: Data Interpretation

Index Value

Wet Areas
- 0 (Potential Surface Water)
- 0 - 0.25 (More Wet)
- 0.25 - 0.5
- 0.5 - 1.5
- 1.5 - 3
- 3 - 4 (Less Wet)
- 4+
Wet Areas Maps: Data Interpretation

Zones of Potential Wetness

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  - 4+

- Dry Areas
  - 0 - 10
  - 10 - 25 (Less Dry)
  - 25 - 50
  - 50 - 100
  - 100 - 200
  - 200+ (More Dry)
Wet Areas Maps: Data Interpretation

Zones of Potential Wetness

Zones of Potential Dryness
Since the model output predicts "wetness" it also predicts "dryness"
Wet Areas Maps: Data Interpretation

Since the model output predicts “wetness” it also predicts “dryness”

The same model output, symbolized differently will show something completely different.
Wet Areas Maps: Data Interpretation

High-resolution “dry” areas mapping:
- potential habitat mapping
- potential sites of historic settlements
- Fire-risk maps
- Soil erosion/disturbance potential
- Trafficability modeling
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- potential habitat mapping
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The symbology for “dry areas” is included in the mapping package.
Combining these two mapping products can provide a great interpretation of predicted topographic moisture gradients in the landscape.
Wet Areas Maps: Data Format

Model output is a floating point ESRI Raster

- Native Grid format for ESRI’s ArcGIS (ie. ArcMap)

- One floating point (decimal) value for every 1 m² cell in the landscape
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**Symbology**

- 0 – 0.1
- 0.1 – 0.25
- 0.25 – 0.5
- 0.5 - 1
- 1+ (transparent)
Wet Areas Maps: Data Format

Model output is a floating point ESRI Raster

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![Symbology](image)

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![Data Table](image)
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- Cell values remain unchanged, but a symbology can be applied to visualize the maps. Datasets are large.

- Best format for:
  - GIS analysis
  - Input into additional planning models
Wet Areas Maps: Data Format

Model output is also supplied as Color-Mapped GeoTIFF

-Easily read by all current GIS software and image editors

-One integer (non-decimal) CODE for every 1 m$^2$ cell in the landscape
Wet Areas Maps: Data Format

Model output is also supplied as Color-Mapped GeoTIFF

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2 1 1 1 2 3 3 2 1 1
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Wet Areas Maps: Data Format

Model output is also supplied as **Color-Mapped GeoTIFF**

- Easily read by all current GIS software and image editors
- One integer (non-decimal) CODE for every 1 m² cell in the landscape

![Internal Symbology Table]

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Model output is also supplied as **Color-Mapped GeoTIFF**

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- One integer (non-decimal) CODE for every $1 \text{ m}^2$ cell in the landscape

- Cell values are changed to “classes” and internally symbolized to visualize the maps. No additional steps required.

- Results in drastically smaller datasets (1 GB Raw Data = ~6 MB GeoTIFF)

- Best format for visualizing data quickly and efficiently
Wet Areas Maps: Data Storage

100 m² Cell

25 m² Cell

1 m² Cell
Q: How much space is required for 1,000 hectares of data?

100 m² Cell

25 m² Cell

1 m² Cell
Wet Areas Maps: Data Storage

Q: How much space is required for 1,000 hectares of data?

100 m² Cell
1 Cell
1,000 ha = 100,000 Cells
1,000 ha ~ 0.34 MB

25 m² Cell
4 Cells
400,000 Cells
1.37 MB

1 m² Cell
100 Cells
10,000,000 Cells
34 MB
Wet Areas Maps: Data Storage

Resolution vs Storage Capacity: A Tradeoff

1 m² Cell

25 m² Cell

100 m² Cell

More Storage → Less Storage
Wet Areas Maps: Data Usage

In the Office

Model output is natively read by all ESRI products
- ArcMap/ArcCatalog
- ArcGIS Server
- ArcView GIS

Model output can be converted for use in many other programs
- Shapefiles
- ASCII Raster
- TIFF/JPEG/BIL/IMG
- many others
Wet Areas Maps: Data Usage

In the Field
Catchment Area = 24.6 ha
Peak Flow Estimate = 1.88 m³/sec
Suggested Min. Culvert Diameter = 0.36m
Wet Areas Maps: Summary

-LiDAR provides the high-resolution input to Wet Areas Mapping

-Culvert data improves model output by properly “breaching” roads to maintain flow

-Wet Areas maps are topography-driven

-Wet Areas maps also predict Dry Areas

-Model Output is easily read by all common GIS software
Wet Areas Maps

Thank You

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