Federal Geographic Data Committee
Metadata Summit Summary
October 26-27, 2011
Reston, Virginia

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FGDC Metadata Summit Summary
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Introduction

The Federal Geographic Data Committee (FGDC) hosted a two day Metadata Summit on October 26-27, 2011 at the U.S. Geological Survey in Reston, Virginia to bring National Spatial Data Infrastructure (NSDI) stakeholders up to date on International Organization for Standardization (ISO) metadata standards, identify challenges, and set a course for implementation. The meeting included:

- ISO Metadata Training Workshop
- ISO and ISO North American Profile (NAP) Metadata Standards Status Update
- Group Discussions: ISO Implementation
- Group Discussions: ISO Tools and Applications
- Group Discussions: ISO Education and Communication

A follow-up Webinar meeting was held on December 7, 2011 that presented the results of the Summit to interested participants who were unable to attend the October session.

Workshop Structure

The Metadata Summit was conducted over a period of 2 days consisting of an optional ISO Metadata Training Workshop on the first day and plenary presentations and breakout group discussions on the second day (Appendix A).

The ISO Metadata Training Workshop was instructed by Jacqueline Mize and Kathy Martinolich from NOAA and reached its capacity of 25 participants. The training gave attendees the opportunity to get hands-on experience with the ISO standards, its components, and provide information on its use. Specific topics included Transitioning 101; ISO 191** Content and Organization; XML Basics; ISO 191** Content Detailed Review; Tools for Creating and Editing ISO Metadata; ISO Creation Methods; and Validation Techniques. The training workshop provided a foundation of knowledge for the second day of the Summit.

On the second day, the plenary sessions began with opening remarks from Ivan DeLoatch (Director, FGDC) and were followed by a series of presentations intended to get all participants informed about current ISO standards, tools, training, and implementation status.
Five speakers gave presentations including:
- Aleta Vienneau (ESRI) on “ISO Standards: Status, Tools, Implementations and Training” (on behalf of her co-author David Danko, ESRI)
- Jacqueline Mize (NOAA) on “Applications and Tools”
- Rob Dollison (USGS) on “Geospatial Platform Update - Migration of GOS to Data.gov”
- Ted Habermann (NOAA) on “Metadata Implementation”
- Jacqueline Mize (NOAA) on “Training and Education”

These presentations provided an overview of current ISO activities and led to facilitated breakout group discussions that covered each of these topics in more detail.

In the afternoon on day 2, three breakout groups, each with a specific area of focus, identified common issues and discussed recommendations for common solutions associated with their agency or organization’s approach in the context of addressing and implementing ISO metadata standards. In the original agenda, a fourth breakout group focused on the ISO standards had been identified, but participants felt they had more contributions to the other three topics, so this breakout group was dropped during the meeting. Breakout group descriptions:

1. **ISO Implementation**: This group focused on issues related to the integration of the ISO metadata standard into the geospatial data management and workflow. The overarching question addressed was: *Assuming that the standard is stable and tools and training are available, what workflow and management challenges do you face in transitioning your organization from the CSDGM to ISO metadata?*

2. **ISO Tools and Applications**: This group focused on issues related to the tools needed to effectively create, transform, validate, and publish ISO metadata. The overarching question addressed was: *What specific application capabilities are needed to support ISO metadata within your organization?*

3. **ISO Education and Communication**: This group focused on issues related to outreach and training required to support transitioning to ISO metadata, including: guidance documents, instructional materials, promotional materials, tutorials, websites, and training events. The overarching question addressed was: *What training and outreach resources are needed to support the transition from CSDGM to ISO metadata?*

Each breakout group’s discussion was led by a facilitator and documented by a note taker:
- ISO Implementation - the facilitator was Lynda Wayne (FGDC Office of the Secretariat / GeoMaxim) and note takers were Jennifer Carlino (USGS), Marcia McNiff (USGS), and Karen Arcamonte (COMSO, Inc./USGS);
- ISO Tools and Applications - the facilitator was Jacqueline Mize (NOAA) and the notetaker was Kathy Martinolich (NOAA);
- ISO Education and Communication - the facilitator was Viv Hutchison (USGS) and the notetaker was Hugh O’Connor (COMSO, Inc./USGS).
The breakout groups each prepared and presented a report of their findings and recommendations at the end of each day, and their notes and reports were also submitted to the workshop organizers. This information is included in this final Metadata Summit Summary document.

An ISO Metadata Training Workshop Evaluation Form was distributed to all participants at the end of Day 1. A Metadata Summit Evaluation Form was distributed to all participants at the end of Day 2.

**Metadata Summit Participation**

The Metadata Summit was attended by a total of 52 participants that represented a diverse array of organizational affiliations including:

**Federal Agencies**

Bureau of Ocean Energy Management (BOEM) - 4  
Census Bureau  
Department of Defense - Defense Installation Spatial Data Infrastructure (DISDI) Program  
Department of Homeland Security (DHS)  
Department of Transportation (DOT)  
Environmental Protection Agency (EPA)  
Federal Aviation Administration (FAA)  
Federal Geographic Data Committee (FGDC) – 4  
Forest Service (USDA)  
Housing and Urban Development (HUD)  
Library of Congress  
National Geospatial Intelligence Agency (NGA)  
National Oceanic and Atmospheric Administration (NOAA) - 9  
National Park Service (NPS) - 2  
Natural Resources conservation Service (NRCS)  
U.S. Geological Survey (USGS) - 9  
U.S. Army Corps of Engineers (USACE)

**Non Federal Organizations**

CIESIN, Columbia University  
ESRI - 3  
Innovative Solutions International - 2  
New Jersey Office of Information Technology  
Rahall Transportation Institute  
The SI Organization  
Valtus Imagery Services  
Westat
Workshop Metadata Summit Evaluation

The FGDC received a 55% response rate to the workshop evaluation with 29 workshop evaluation forms submitted by participants.

Audience Assessment indicated high satisfaction for:

- Summit as a good forum to communicate about ISO implementation
- Quality of presentations (informative and good foundation for discussion)
- Breakout groups well facilitated
- Opportunity to express opinions and ask questions
- Information will aid in job performance
- Learning from other agencies and organizations

Overall, three main themes were identified in the evaluations:

- Overall recognition that Federal agencies should be moving to ISO now
- Participants saw value in implementation of ISO on a larger scale
- High interest in seeing another Summit offered within 6 months to 1 year

Suggestions for future ISO Metadata Summits or forums included focusing on very specific topics rather than general categories, coming up with actionable tasks in the workshop, having more time in the breakout groups for discussion, possibly offering an online attendance option, and ensuring there are fewer people in each break out group to stimulate discussion.

ISO Metadata Training Evaluation

For the ISO Metadata Training Workshop, NOAA received a 75% response rate to the workshop evaluation with 22 workshop evaluation forms submitted by participants.

Overall, the training workshop improved the participants understanding of the similarities and differences between the Content Standard for Digital Geospatial Metadata (CSDGM) and ISO, as well as communicated about where to find assistance in creating ISO metadata. Participants felt they needed additional time to be able to write ISO compliant metadata, but the training helped them learn about tool availability, XML basics, and provided the opportunity to do hands on exercises.

Suggestions for future ISO metadata training workshops included the preference of attendees to have 1 computer per student, access to best practices, and more tips for writing compliant ISO metadata.
**Metadata Summit Follow Up Webinar**

A Metadata Summit Webinar meeting was held on December 7, 2011 to present results of the Summit to interested participants who were unable to attend the October session. Approximately 175 people registered for the Webinar with capacity for 100 attendees. Webinar organizers presented an overview of the Metadata Summit that was held on October 26-27, 2011 in Reston, Virginia. A recording of the Webinar is available on the FGDC Web site (http://www.fgdc.gov/metadata/events/metadata-summit/index_html). The presentation can be found in Appendix C. After the presentation, several questions from the participants were addressed and a summary of those comments are included in Appendix D.

**Conclusion**

The Metadata Summit brought together stakeholders from across the Federal Geographic Data Committee community to learn more about ISO metadata standards, tools, and implementation as well as to identify specific challenges and potential recommendations for moving forward. This Metadata Summit Summary and the attached consolidated recommendations provide a foundation for FGDC agencies and affiliated organizations to begin addressing ISO implementation.

**Acknowledgements**

The planning team consisted of several agency representatives from across the country who worked together to develop the agenda, conduct ISO metadata training, facilitate breakout group discussions, coordinate logistics, present the results at the webinar, and submit this summary to the FGDC Office of the Secretariat. In alphabetical order:

Jennifer Carlino, USGS (co-lead)
Viv Hutchison, USGS (co-lead)
Jacqueline Mize, NOAA
Brigitta Urban-Mathieux, FGDC Office of the Secretariat
Lynda Wayne, FGDC Office of the Secretariat / GeoMaxim
Appendix A

Agenda

Purpose
To cooperatively determine a course of action for moving forward with ISO metadata implementation

Goals
• Establish a common understanding about ISO metadata initiatives and implementation
• Determine mutually significant metadata issues best addressed with a common strategy
• Develop a course of action that includes alternate paths for achieving common strategic objectives

Outcomes
• Written report on the Summit (discussion topics, decisions, and recommendations)
• Follow-up webinar summarizing meeting outcomes for those unable to attend the Summit

Agenda

<table>
<thead>
<tr>
<th>Time</th>
<th>Topic</th>
<th>Lead:</th>
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<tbody>
<tr>
<td>8:30-9:00</td>
<td>Welcome/Introductions/Overview and Agenda</td>
<td>Ivan DeLoatch, Vivian Hutchison, Jennifer Carlino</td>
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<tr>
<td>9:00-9:20</td>
<td>ISO Standards/Overview and status</td>
<td>David Danko</td>
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<td>9:20-9:30</td>
<td>Q&amp;A</td>
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<td>9:30-9:50</td>
<td>Applications/What tools are available?</td>
<td>Jacqueline Mize, Robert Dollison</td>
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<tr>
<td>9:50-10:00</td>
<td>Q&amp;A</td>
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<td>10:00-10:15</td>
<td>BREAK</td>
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<tr>
<td>Time</td>
<td>Session</td>
<td>Presenter</td>
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<td>10:15-10:35</td>
<td>Implementation &lt;br&gt; <em>How are organizations applying ISO standards; to what benefit?</em>&lt;br&gt; - 19115-1 - Metadata&lt;br&gt; - 19119-2 – Imagery &amp; Gridded Data&lt;br&gt; - Other</td>
<td>Ted Habermann</td>
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<td>10:35-10:45</td>
<td>Q&amp;A</td>
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<td><strong>ISO Standards: Status, Tools, Implementations, and Training (continued)</strong>&lt;br&gt; 10:45-11:05</td>
<td>Training &lt;br&gt; <em>What training and outreach resources are available?</em>&lt;br&gt; - Guidance Docs&lt;br&gt; - Presentations&lt;br&gt; - Workshops and Materials&lt;br&gt; - Online Lessons</td>
<td>Jacqueline Mize</td>
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<td>11:05-11:15</td>
<td>Q&amp;A</td>
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<td>11:15-11:30</td>
<td>Explanation of Breakout Groups</td>
<td>Vivian Hutchison</td>
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<td>11:30 - 12:30</td>
<td>LUNCH</td>
<td>on your own USGS Cafeteria</td>
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<td><strong>Discussion of Metadata Issues: Breakouts</strong>&lt;br&gt; 12:30-1:45</td>
<td>Identification of Common Issues &lt;br&gt; <em>What are the challenges and opportunities?</em></td>
<td>Standards (Carlino) Applications (Mize) Implementation (Wayne) Education (Hutchison)</td>
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<td>1:45-2:45</td>
<td>Recommendations for Common Solutions &lt;br&gt; <em>How do we address each issue?</em></td>
<td>Standards (Carlino) Applications (Mize) Implementation (Wayne) Education (Hutchison)</td>
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<td>2:45-3:00</td>
<td>BREAK</td>
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<tr>
<td>3:00-4:15</td>
<td>Summary of Challenges and Solutions Discussion</td>
<td>Group Reports</td>
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<td>4:15-4:30</td>
<td>Setting the Course: &lt;br&gt; Next Steps Closing and Adjourn</td>
<td>Vivian Hutchison &amp; Jennifer Carlino</td>
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Contacts

Jennifer Carlino  
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ISO Metadata Training Workshop Agenda

Topics covered in Day 1 “Transitioning to ISO” Training:

• Transitioning 101
• ISO 191** Content and Organization
• XML Basics
• ISO 191** Content Detailed Review
• Tools for Creating and Editing ISO Metadata
• ISO Creation Methods
• Validation Techniques
**Workshop Summary of Issues and Actions**

During the FGDC Metadata Summit on October 27, 2011, participants gathered together in groups to discuss a variety of broad topics related to the ISO standards including standards, applications and tools, implementation, and education and training. The following is a summary of the issues, solutions, and actions generated by the breakout groups.

**Policy and Guidance Issues**

<table>
<thead>
<tr>
<th>Issue: Currently, there is uncertainty in agencies about which standard to choose: FGDC or ISO</th>
<th>Solution</th>
<th>Actions</th>
<th>Lead</th>
<th>Time Frame</th>
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<tr>
<td></td>
<td><strong>Provide current</strong> guidance as to which geospatial metadata standard(s) should and can be used</td>
<td>Develop an ISO implementation guidance statement that encourages and supports exploration and implementation of ISO metadata</td>
<td>FGDC Metadata Coordinator with FGDC Member Agencies</td>
<td>&lt; 6 months</td>
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<tr>
<td></td>
<td></td>
<td>Update the ISO implementation guidance at the FGDC Metadata website with the revised statement</td>
<td>FGDC Metadata Coordinator</td>
<td>&lt; 6 months</td>
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<tr>
<th>Solution</th>
<th>Actions</th>
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<th>Time Frame</th>
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<tbody>
<tr>
<td>Offer situational &quot;use cases&quot; and workflow solutions (i.e., decision tree)</td>
<td>Research different types of use cases in agencies with varying missions and goals</td>
<td>FGDC Member Agencies</td>
<td>&lt; 6 months</td>
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<tr>
<td></td>
<td>Develop use cases for variety of situations (e.g., here is a situation, and here is how you can deal with it and provide very specific advice for specific situations, considering “user stories.”)</td>
<td>FGDC Member Agencies</td>
<td>6 -12 months</td>
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<td></td>
<td>Develop clear and simple guidance documents (including FAQs) to address each of the situations</td>
<td>FGDC Members Agencies</td>
<td>&gt;12 months</td>
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</tbody>
</table>
**Issue: Organizations need a compelling case for ISO metadata implementation**

Change requires time, effort and money. The benefits of ISO metadata must be documented and demonstrated to aid agencies in realizing the value of transitioning to ISO metadata. There are also many different scenarios in transitioning a large federal or non-federal agency to the ISO standard, particularly when the FGDC standard is engrained in various workflows. The easier the process, the more effective and efficient the transition. Resources are needed to support organizations in making the transition to ISO metadata.

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<th>Solution</th>
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<tr>
<td>Highlight and demonstrate the benefits of ISO metadata to agency Directors, managers and staff. This approach can also be applied to non-federal organizations.</td>
<td>Compile and present benefits specifically supported by the ISO standard (e.g. ability to document services, reusable content) and the process of transition (e.g. opportunity to review/clean up metadata holdings)</td>
<td>An FGDC Member Agency</td>
<td>6-12 months</td>
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<td></td>
<td>Develop a business case that demonstrates the operational advantage of ISO and how ISO metadata can be used as a data management and metadata assessment tool, e.g. NOAA metadata completeness rubric</td>
<td>An FGDC Member Agency</td>
<td>6-12 months</td>
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<td></td>
<td>Sponsor and promote the development of some ‘Killer App’ - ISO metadata demonstration projects, e.g. alternative presentations of metadata as documentation to show multiple views/uses of the same metadata record</td>
<td>FGDC Coordination Group</td>
<td>6-12 months</td>
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<td></td>
<td>Tie ISO metadata implementation to the organization’s mission and/or activities</td>
<td>Identify ISO metadata features that can be tied to the general mission of geospatial organizations (e.g. data sharing)</td>
<td>An FGDC Member Agency</td>
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<td></td>
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<td>Identify ISO metadata features that can be tied to key initiatives (e.g. Geospatial Platform)</td>
<td>FGDC Secretariat</td>
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<td></td>
<td>Develop other ISO implementation guidance documents and online resources</td>
<td>Compile and present ISO best practices; transform strategies (key post-transform edits, etc.); implementation strategies (transform once, legacy metadata, etc.); and workflows (NOAA spirals, etc.)</td>
<td>FGDC Metadata Coordinator &amp; Metadata Working Group</td>
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### Issue: Organizations need a compelling case for ISO metadata implementation (cont’d)

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<th>Solution</th>
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<tr>
<td><strong>Workflow guidance</strong></td>
<td>Develop workflow guidance for creating ISO records, metadata templates and importing FGDC or earlier format records and batch import/export of records, including guidance specific to ESRI catalog records</td>
<td>FGDC Metadata Working Group</td>
<td>Six months</td>
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<td></td>
<td>Develop a user-friendly reference to the ISO standard, e.g. online, interactive resource</td>
<td>FGDC Metadata Coordinator &amp; Metadata Working Group</td>
<td>6-12 months</td>
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<td></td>
<td>Establish an ISO metadata transformation and implementation consultation service</td>
<td>OMB, Each Agency &amp;/or Private Sector</td>
<td>6-12 months</td>
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<td></td>
<td>Research and create FAQs for transitioning to ISO</td>
<td>FGDC Metadata Coordinator &amp; Metadata Working Group</td>
<td>6-12 months</td>
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<tr>
<td><strong>Develop guidance on building an agency profile</strong></td>
<td>Identify or develop an ISO 191** overview that indicates the content and value of each standard</td>
<td>An FGDC Member Agency</td>
<td>&gt; 1 year</td>
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<td></td>
<td>Solicit agencies on CSDGM customizations and custom content to be preserved in ISO including agency specific data quality requirements</td>
<td>FGDC Coordination Group</td>
<td>&gt; 1 year</td>
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<td></td>
<td>Produce guidance (doc or online resource) that incorporates and addresses items above of the above</td>
<td>FGDC Metadata Coordinator</td>
<td>&gt; 1 year</td>
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<td>Outline Agency-specific requirements of and procedures for profile development</td>
<td>Each FGDC Member Agency</td>
<td>&gt; 1 year</td>
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<td><strong>Develop a registry of Agency profiles</strong></td>
<td>Develop registry form to effectively describe profile content and rationale</td>
<td>FGDC Metadata Coordinator &amp; Webmaster</td>
<td>&gt; 1 year</td>
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<td></td>
<td>Publish and promote the registry</td>
<td>FGDC Coordination Group</td>
<td>&gt; 1 year</td>
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**Issue: Need to develop ISO metadata implementation directives**

Organizations need management and higher level executive support to implement ISO metadata.

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<th>Solution</th>
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<tr>
<td>Draft and promote <strong>federal</strong> language specific to ISO metadata implementation</td>
<td>Draft a federal directive that identifies a common strategy towards ISO metadata implementation</td>
<td>FGDC Coordination Group</td>
<td>&lt; 6 months</td>
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<td>Draft federal grant and contract language for ISO compliant metadata deliverables</td>
<td>FGDC Coordination Group</td>
<td>6-12 months</td>
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<td></td>
<td>Promote ISO implementation directive for endorsement by OMB or other federal administrative body</td>
<td>FGDC Executive Committee</td>
<td>&lt; 6 months</td>
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<tr>
<td>Draft and promote ISO metadata implementation directive model language for use by <strong>non-federal</strong> organizations</td>
<td>Draft model non-federal directive language (that includes performance measure criteria)</td>
<td>NSDI Stakeholder organizations (NSGIC, URISA, etc.) or NGAC</td>
<td>&gt; 1 year</td>
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<td></td>
<td>Draft model non-federal policy language</td>
<td>NSDI Stakeholder organizations (NSGIC, URISA, etc.) or NGAC</td>
<td>&gt; 1 year</td>
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<tr>
<td></td>
<td>Draft model non-federal contract language for deliverables</td>
<td>NSDI Stakeholder organizations (NSGIC, URISA, etc.) or NGAC</td>
<td>&gt; 1 year</td>
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### Issue: Provide incentives and resources for transition to ISO metadata

In addition to directives, incentives should also be developed to encourage ISO metadata implementation.

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<tr>
<td>Include ISO metadata creation in performance plans and other metrics.</td>
<td>Review existing agency performance plans and metrics and incorporate ISO metadata implementation where effective</td>
<td>Each FGDC Member Agency</td>
<td>&gt; 1 year</td>
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<td>Promote ISO metadata implementation during performance and metric planning</td>
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<td>FGDC Coordination Group</td>
<td>&gt; 1 year</td>
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<tr>
<td>Provide the training, time, tasking and resources needed to implement the new standard</td>
<td>Include ISO metadata training, and software application expenses during budgeting</td>
<td>Each FGDC Member Agency</td>
<td>6-12 months</td>
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<td>Include ISO metadata creation in position descriptions and outcomes</td>
<td>Each FGDC Member Agency</td>
<td>6-12 months</td>
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<td>Include ISO metadata time and effort during project planning and tasking to address upgrades and changes to ISO</td>
<td>Each FGDC Member Agency</td>
<td>6-12 months</td>
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<tr>
<td>Include as a maturity model component</td>
<td>Identify specific maturity model components that should address ISO metadata, e.g. quality assurance, requirements management, project management, availability management, data collection, etc.</td>
<td>An FGDC Member Agency</td>
<td>&gt; 1 year</td>
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<td></td>
<td>Develop model ISO metadata language for each relevant maturity model component</td>
<td>An FGDC Member Agency</td>
<td>&gt; 1 year</td>
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<td>Publish and make model language available</td>
<td>FGDC Metadata Coordinator and Webmaster</td>
<td>&gt; 1 year</td>
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## Tools and Applications Issues

### Issue: Need Comprehensive User-Friendly Tools and Stable Standards

There is a lack of comprehensive / user-friendly tools for cataloging/publishing, editing, translating, validation, and approval. Also, schema development is not parallel with standards and stable schemas are needed for tool development and publishing records.

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<tr>
<td>Develop applications (editors, transformation, validation, publication) to support ISO implementation (AKA 'get the technology done so the people can do the work')</td>
<td>Establish a nonproprietary, free, simple to use, online ISO metadata editor as a Geospatial Platform shared service</td>
<td>An FGDC Member Agency(ies)</td>
<td>&gt; 1 year</td>
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<td>Develop an ISO online reference resource that enables user access to ISO metadata element and content descriptions without copyright restrictions</td>
<td>FGDC Metadata Program</td>
<td>6-12 months</td>
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<tr>
<td>Solution</td>
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<td>Update tool review by vendors</td>
<td>Provide desired requirements list for vendors</td>
<td>FGDC Metadata Working Group</td>
<td>6-12 months</td>
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<td></td>
<td>Capabilities specific</td>
<td>FGDC Metadata Working Group</td>
<td>6-12 months</td>
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<tr>
<td>Solution</td>
<td>Actions</td>
<td>Lead</td>
<td>Time Frame</td>
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<tr>
<td>Need vendors (e.g., ESRI) to fully support ISO standards</td>
<td>Work with vendors</td>
<td>FGDC Metadata Working Group</td>
<td>6-12 months</td>
</tr>
<tr>
<td>Solution</td>
<td>Actions</td>
<td>Lead</td>
<td>Time Frame</td>
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<tr>
<td>UML needs to be finalized and stable</td>
<td>Volunteer to review standards documents and promote schema development</td>
<td>FGDC Metadata Working Group</td>
<td>&lt; 6 months</td>
</tr>
<tr>
<td>Solution</td>
<td>Actions</td>
<td>Lead</td>
<td>Time Frame</td>
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</tr>
<tr>
<td>Have geodata.gov provide ISO 19115-2 support</td>
<td>Work with geodata.gov and Geospatial Platform developers</td>
<td>FGDC Member Agency</td>
<td>&lt; 6 months</td>
</tr>
<tr>
<td></td>
<td>Document data.gov ISO metadata publication capabilities and process</td>
<td>Data.gov/geoedata program</td>
<td>&lt; 6 months</td>
</tr>
<tr>
<td></td>
<td>Identify ISO metadata publication options for the non-federal community</td>
<td>Data.gov/geoedata program</td>
<td>6-12 months</td>
</tr>
<tr>
<td>Solution</td>
<td>Actions</td>
<td>Lead</td>
<td>Time Frame</td>
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<tr>
<td>Put records into a repository</td>
<td>Geonetwork is an option for harvesting and publishing or use a CSW for your repository</td>
<td>FGDC Member Agency</td>
<td>&lt; 6 months</td>
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</table>
## Education and Communication Issues

### Issue: Need qualified ISO trainers
Currently there are not many qualified ISO trainers available. Need to develop an ISO trainer cadre to broaden availability of ISO training.

<table>
<thead>
<tr>
<th>Solution</th>
<th>Actions</th>
<th>Lead</th>
<th>Time Frame</th>
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</thead>
<tbody>
<tr>
<td>Develop an ISO metadata trainer</td>
<td>Establish ISO train the trainer metadata workshop curriculum</td>
<td>FGDC Metadata Coordinator &amp; Trainers</td>
<td>6-12 months</td>
</tr>
<tr>
<td>program</td>
<td>Establish ISO train the trainer metadata online training materials to support curriculum</td>
<td>FGDC Metadata Coordinator &amp; Trainers</td>
<td>6-12 months</td>
</tr>
<tr>
<td></td>
<td>Offer train the trainer workshops to get current FGDC trainers up to speed on ISO</td>
<td>FGDC Metadata Coordinator &amp; Trainers</td>
<td>6-12 months</td>
</tr>
<tr>
<td></td>
<td>Host 2-3 workshops per year</td>
<td>FGDC Metadata Coordinator &amp; Trainers</td>
<td>&lt; 1 year</td>
</tr>
</tbody>
</table>

### Issue: Offer training in different formats
In this tight budget and travel limited environment, there is a need for training to be offered in different formats to reach a wide audience.

<table>
<thead>
<tr>
<th>Solution</th>
<th>Actions</th>
<th>Lead</th>
<th>Time Frame</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offer live webinars</td>
<td>Develop webinars to different learning levels</td>
<td>FGDC Metadata Coordinator &amp; Trainers</td>
<td>6-12 months</td>
</tr>
<tr>
<td></td>
<td>Host webinars on quarterly (or other determined) schedule</td>
<td>FGDC Metadata Working Group</td>
<td>6-12 months</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Solution</th>
<th>Actions</th>
<th>Lead</th>
<th>Time Frame</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offer recorded training sessions where users can attend on their own schedule</td>
<td>Record training sessions</td>
<td>FGDC Metadata Coordinator &amp; Trainers</td>
<td>6-12 months</td>
</tr>
<tr>
<td></td>
<td>Host webinars online</td>
<td>FGDC Metadata Coordinator &amp; Trainers</td>
<td>6-12 months</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Solution</th>
<th>Actions</th>
<th>Lead</th>
<th>Time Frame</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continue to offer classroom training.</td>
<td>Develop and host classroom training</td>
<td>FGDC Metadata Coordinator &amp; Trainers</td>
<td>6-12 months</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Solution</th>
<th>Actions</th>
<th>Lead</th>
<th>Time Frame</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online Help Hours</td>
<td>Offer online help (chat, etc.) during certain office hours</td>
<td>FGDC Metadata Coordinator &amp; Trainers</td>
<td>&gt; 1 year</td>
</tr>
</tbody>
</table>
**Issue: Develop ISO training for a variety of user audiences**

There is a need for training to address different types of audiences that covers more people in different kinds of roles. Training also needs to incorporate other tools beyond XML editors to address a variety of user’s needs.

<table>
<thead>
<tr>
<th>Solution</th>
<th>Actions</th>
<th>Lead</th>
<th>Time Frame</th>
</tr>
</thead>
<tbody>
<tr>
<td>Develop a ISO metadata training program based on 3-tiered approach (Beginner, Intermediate, Advanced)</td>
<td>Establish ISO metadata workshop curriculum</td>
<td>FGDC Metadata Coordinator &amp; Trainers</td>
<td>6-12 months</td>
</tr>
<tr>
<td></td>
<td>Establish ISO metadata online training materials to support curriculum</td>
<td>FGDC Metadata Coordinator &amp; Trainers</td>
<td>6-12 months</td>
</tr>
<tr>
<td></td>
<td>Develop training for ISO beginners</td>
<td>FGDC Metadata Coordinator &amp; Trainers</td>
<td>6-12 months</td>
</tr>
<tr>
<td></td>
<td>Develop training for ISO intermediates</td>
<td>FGDC Metadata Coordinator &amp; Trainers</td>
<td>6-12 months</td>
</tr>
<tr>
<td></td>
<td>Develop training for ISO advanced</td>
<td>FGDC Metadata Coordinator &amp; Trainers</td>
<td>6-12 months</td>
</tr>
<tr>
<td>Consider work roles when designing training: &quot;Role-based training&quot;</td>
<td>Devise list of different role types in federal agencies who would be doing ISO metadata</td>
<td>FGDC Metadata Coordinator &amp; Trainers</td>
<td>6-12 months</td>
</tr>
<tr>
<td></td>
<td>Tailor training materials to address each different role</td>
<td>FGDC Metadata Coordinator &amp; Trainers</td>
<td>6-12 months</td>
</tr>
<tr>
<td>Offer &quot;certified metadata expert&quot; labels to those completing a certain level of training.</td>
<td>Develop certified ISO metadata creator certificates for intermediate and advanced training sessions</td>
<td>FGDC Metadata Coordinator &amp; Trainers</td>
<td>6-12 months</td>
</tr>
<tr>
<td></td>
<td>Offer training at the university student level</td>
<td>FGDC Metadata Coordinator &amp; Trainers</td>
<td>&gt; 1 year</td>
</tr>
<tr>
<td></td>
<td>Advertise trainers through FGDC website</td>
<td>FGDC Metadata Coordinator &amp; Trainers</td>
<td>6-12 months</td>
</tr>
<tr>
<td>Offer step by step guidance for use of non XML editor tools</td>
<td>Choose 2-3 GUI-based tools and develop guidance for those tools, once they are mature</td>
<td>FGDC Metadata Coordinator &amp; Trainers</td>
<td>&gt; 1 year</td>
</tr>
<tr>
<td></td>
<td>Create easy to use materials for each tool</td>
<td>FGDC Metadata Coordinator &amp; Trainers</td>
<td>&gt; 1 year</td>
</tr>
</tbody>
</table>
### Issue: Need the ability to learn from and build upon existing implementation efforts and resources

Valuable lessons have been learned by those leading ISO implementation. A mechanism is needed for cross agency collaboration and sharing lessons learned, best practices, resources developed, workflow strategies, agency profiles of ISO, etc.

<table>
<thead>
<tr>
<th>Solution</th>
<th>Actions</th>
<th>Lead</th>
<th>Time Frame</th>
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</thead>
<tbody>
<tr>
<td>Establish an ISO metadata</td>
<td>Create (or enhance existing NOAA wiki) to</td>
<td>NOAA or other FGDC</td>
<td>&lt; 6 months</td>
</tr>
<tr>
<td>implementation wiki workspace</td>
<td>support features listed in issue description (best practices, workflows, resources, etc.)</td>
<td>Member Agency</td>
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<tr>
<td></td>
<td>Establish wiki management responsibilities</td>
<td>NOAA or other FGDC</td>
<td>&lt; 6 months</td>
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<tr>
<td></td>
<td>Promote wiki participation</td>
<td>FGDC Coordination Group</td>
<td>&lt; 6 months</td>
</tr>
<tr>
<td>Solution</td>
<td>Actions</td>
<td>Lead</td>
<td>Time Frame</td>
</tr>
<tr>
<td>Regular webinars that feature ISO</td>
<td>Organize and manage regular webinars</td>
<td>FGDC Metadata Working</td>
<td>&lt; 6 months</td>
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<tr>
<td>implementation efforts &amp; outcomes</td>
<td></td>
<td>Group</td>
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<tr>
<td>Reuse existing tools and training</td>
<td>Make available training opportunities via the wiki or FGDC website</td>
<td>FGDC Metadata Working</td>
<td>&lt; 6 months</td>
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<td>Group</td>
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<tr>
<td>Communication/better understanding</td>
<td>Create mailing list to distribute updates</td>
<td>FGDC Metadata Working</td>
<td>&lt; 6 months</td>
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<tr>
<td>of standards process</td>
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<td>Group</td>
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</tbody>
</table>
Overview of the FGDC Metadata Summit 2011
Summit Planning Committee

- Viv Hutchison, USGS
- Jacqueline Mize, NOAA
- Lynda Wayne, FGDC Office of the Secretariat
- Jennifer Carlino, USGS
- Brigitta Urban-Mathieux, FGDC Office of the Secretariat
FGDC Metadata Summit Overview

- **Dates:** October 26-27, 2011
- **Location:** USGS Headquarters (Reston, VA)
- **Purpose:** To cooperatively determine a course of action for moving forward with ISO metadata implementation
- **Day 1:** ISO Training (optional) – 25 participants
- **Day 2:** Metadata Summit – 52 participants
Summit Participant Affiliations

- BOEM
- Census
- DHS
- DOT
- EPA
- FAA
- FGDC
- Forest Service
- HUD
- Library of Congress
- NGA
- NOAA
- NPS
- NRCS
- USGS
- USACE
- CIESIN, Columbia University
- ESRI
- DISDI Program
- Innovative Solutions International
- NJ Office of Information Technology
- Rahall Transportation Institute
- The SI Organization
- Valtus Imagery Services
- Westat
Overview of Summit Agenda (Day 1)

“Transitioning to ISO” Training:

- Transitioning 101
- ISO 191** Content and Organization
- XML Basics
- ISO 191** Content Detailed Review
- Tools for Creating and Editing ISO Metadata
- ISO Creation Methods
- Validation Techniques
Overview of Summit Agenda (Day 2)

- Presentations on Status of ISO...
  - Applications and Tools: Jacqueline Mize, NOAA
  - Geospatial Platform Update - Migration of GOS to Data.gov: Rob Dollison, USGS
  - ISO Metadata Implementation: Ted Habermann, NOAA
  - Training and Education: Jacqueline Mize, NOAA

- Breakout Group Discussions
Metadata Summit: Overview of Presentations
IV. LEVELS OF RECOGNITION:

This policy establishes two levels of FGDC recognition for non-Federally authored standards and specifications:

_Endorsement_ – The non-Federally authored standard or specification has the same status as that of an FGDC developed standard, i.e., its use by Federal agencies is mandatory.

_Recommendation_ – The non-Federally authored standard or specification is recognized as useful for geographic data capture, exchange, archiving, and/or processing but is not deemed to be of such broad applicability that its use should be made mandatory. The FGDC shall publicize it and encourage its use, but will not require its use by Federal agencies.

Note that in accordance with OMB Circular A-119 this policy does not establish a domestic versus international preference relative to the origin of a candidate voluntary consensus standard or specification.
FGDC Endorsed Standards

- ISO 19110:2005 Geographic information - Methodology for Feature Cataloguing
- ISO 19111:2007 Geographic information – Spatial referencing by coordinates
- ISO 19115:2003 Geographic information – Metadata
- ISO 19115-2:2009 Geographic information – Metadata – Part 2: Extensions for imagery and gridded data
- ISO 19119:2005 Geographic information – Services
- ISO 19139:2007 Geographic information – Metadata – XML schema implementation
Comparing FGDC and ISO

ISO 19115 → FGDC CSDGM (FGDC-STD-001-1998)
ISO 19110 → FGDC CSDGM Section 5 (Entity & Attribute Info)
ISO 19111 → FGDC CSDGM Section 4 (Spatial Reference Info)
Status of the Standards

- ISO 19115-1 is now a DIS (Draft International Standard)
  - Includes Feature Catalogue (ISO 19110) internal to the document
- ISO 19157 is approved DIS (Data Quality)
  - Will pull Data Quality out and into a separate document that can be referenced
- Schema work is currently underway
  - ISO 19139-2 approved DIS (for use with 19115-2)
  - New schemas in development for 19115-1
Applications

- Variety of Tools Available
  - Transforms
    - FGDC to ISO
    - Other standards to ISO
    - Stylesheets for display
  - Editors
    - Many capabilities available
  - Validators
    - Online validation
    - Schema and schematron validation
# Applications

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<thead>
<tr>
<th>Tool Name</th>
<th>Views</th>
<th>Transform Engine [2.0]</th>
<th>Common Catalog Search</th>
<th>Record Management</th>
<th>Ingest records</th>
<th>Export records</th>
<th>Automatic generation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Text</td>
<td>xml</td>
<td>html</td>
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<td>single</td>
<td>batch</td>
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</tr>
</tbody>
</table>
Tool Updates since Summit

- Transforms
- ESRI
- Intergraph
Tool Updates since Summit

- Transforms
  - November 2011 Updates
    - Added other domain values to the value map between geographic coordinate units and resolution scale uom. Previously only "Decimal degrees" would map.
Tool Updates since Summit

- ESRI Geoportal
  - XML attributes can be configured
  - Auto populated fields can be configured and edited
  - WMS and OpenStreetMap search map support
  - Schematron validation support
  - Harvesting enhancements

portal@esri.com
Tool Updates since Summit

- Intergraph Catalogue
  - SDI-Pro server product has GUI for simple record create/view/edit/publish workflows, but the “meat” of the platform is its Catalogue API, which is deployed as part of the CSW Service which SDI-Pro users can stand up, and in multiple custom products.
  - Flexibility to implement multilingual ISO-based profiles
  - Other aspects - can establish user groups, each with its own set of privileges for record view/edit/publish and re-usable elements
Tool Updates since Summit

Intergraph Catalogue Utilities, v1.0.3

<table>
<thead>
<tr>
<th>Tool Name</th>
<th>Open-source</th>
<th>GUI</th>
<th>Web-based</th>
<th>Desktop</th>
<th>Platform Independent</th>
<th>Multilingual</th>
<th>Supported Standards</th>
</tr>
</thead>
</table>

1. Can import FGDC.XML into the database, and can serve those records through the CSW service of the SDI-Pro product, responding to standard OGC queries.
2. The XSLT which controls FGDC import can be utilized, or can be modified/enhanced to map additional FGDC profile elements into ISO-19139 or a custom ISO-based schema.

<table>
<thead>
<tr>
<th>Tool Name</th>
<th>Views</th>
<th>Transform Engine (2.0)</th>
<th>Common Catalog Search</th>
<th>Record Management</th>
<th>Ingest records</th>
<th>Export records</th>
<th>Automatic generation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intergraph Catalogue</td>
<td>*</td>
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</tr>
</tbody>
</table>

Contact:
Bruce Westcott
bruce.westcott@intergraph.com
Data.gov Updates

- Data.gov plans to support ISO metadata in the future
- All current FGDC records are available and accessible in geoplatform.gov
- Contact geodata@usgs.gov with questions
Prepare to Publish ISO Metadata

- Publishing ISO records via Web Accessible Folder (WAF)
  - accessed by users with a web browser
  - indexed by Google and other search engines
  - Harvested freely available utilities

<table>
<thead>
<tr>
<th>Index of /oer-waf/ISO/Resolved/2011/</th>
</tr>
</thead>
<tbody>
<tr>
<td>../</td>
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<tr>
<td>EX1101 COLLECTION RESOLVED.XML</td>
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<td>EX1101 COLLECTION RESOLVED.html</td>
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<td>EX1102 COLLECTION RESOLVED.XML</td>
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<td>EX1102 COLLECTION RESOLVED.html</td>
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<td>EX1103 COLLECTION RESOLVED.XML</td>
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<td>EX1103 COLLECTION RESOLVED.html</td>
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<td>EX1104 COLLECTION RESOLVED.XML</td>
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<td>EX1105 COLLECTION RESOLVED.html</td>
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<td>EX1106 COLLECTION RESOLVED.XML</td>
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<tr>
<td>EX1106 COLLECTION RESOLVED.html</td>
</tr>
</tbody>
</table>
Implementation

- The standards are stabilizing
- Tools are continuing to emerge
- Several agencies have moved forward with ISO
  - NOAA
  - NGA
Training and Education

- Training resources are available! (for a scoped audience)
  - Workshops
  - Presentations
  - Workbooks
  - Lesson plans
  - Curriculum
  - Exercises
  - Examples
  - Wiki’s
Metadata Summit: Results of Breakout Group Discussions
Breakout Group Approach

- Met in groups for afternoon of Summit
  - ISO Implementation
  - ISO Tools and Applications
  - ISO Education and Communication

- Purpose
  - Identification of Common Issues
  - Recommendations for Common Solutions
Breakout Group Descriptions

- ISO Implementation:

**Topic**: Issues related to the integration of the ISO metadata standard into the geospatial data management and workflow

**Question**: Assuming that the standard is stable and tools and training are available, what workflow and management challenges do you face in transitioning your organization from the CSDGM to ISO metadata?
Breakout Group Descriptions

- ISO Tools and Applications:

  **Topic:** Issues related to the tools needed to effectively create, transform, validate, and publish ISO metadata

  **Question:** What specific application capabilities are needed to support ISO metadata within your organization?
ISO Education and Communication:

**Topic:** Issues related to outreach and training required to support transition to ISO metadata including: guidance documents, instructional materials, promotional materials, tutorials, websites, and training events

**Question:** What training and outreach resources are needed to support the transition from CSDGM to ISO metadata?
Summary of Results

- Three broad categories of issues, actions, and recommendations for transitioning to ISO standards
  - **Policy and Guidance** – providing framework for enhancing transition across organizations
  - **Tools and Applications** – providing the means to transition
  - **Education and Communication** – providing the instruction for transition and learning from others
Policy and Guidance

General Outcomes:

- Participants felt that implementation must be led by administrators.

- Until ISO metadata are made policy and incorporated into performance plans, agencies are not likely to invest in a transition and implementation effort.
Policy and Guidance

Recommendations:

- Change the FGDC ‘stay the CSDGM course’ guidance to encourage and support ISO metadata exploration and implementation
  
  *FGDC Metadata Working Group*

- Develop a compelling case for ISO metadata implementation that highlights and demonstrates the benefits to agency directors, managers and staff
  
  *FGDC Coordination Group*

- Develop and promote an administrative directive that outlines a Federal strategy for ISO implementation
  
  *FGDC Coordination Group and FGDC Executive Committee*
Policy and Guidance

- **Recommendations (cont’d)**
  - Provide ISO metadata incentives and resources and include ISO implementation in performance plans, metrics, position descriptions, budgets and contract deliverables
    
    *each FGDC Member Agencies*

  - Develop and share situational ‘use cases’ that demonstrate how and when ISO metadata may be incorporated into the workflow
    
    *FGDC Member Agencies*
General Outcomes:

- Agencies have made great strides in integrating metadata development into their workflow.

- Comprehensive and intuitive ISO metadata tools and applications are needed to assimilated the new standard into existing workflows.
Tools and Applications

- **Recommendations**
  - Develop a nonproprietary, free, simple to use, online ISO metadata editor
    
    **FGDC Member Agencies**
    
  - Develop GIS-internal metadata editors and management tools that are fully compliant to ISO and support the import of CSDGM metadata
    
    **Software developers**
Tools and Applications

- **Recommendations (cont’d)**
  - Update the ISO Metadata Editor Review maintained by the FGDC
    - *FGDC Metadata Working Group*
  - Fully support ISO metadata in data.gov
    - *Data.gov Geodata Program*
  - Develop an online reference that enables users access to ISO metadata element format and content descriptions without copyright restrictions
    - *FGDC Metadata Program*
Education and Communication

General Outcomes:

- Agencies require critical information about the content and application of ISO metadata standards to move forward with implementation.

- ISO relevant training, training materials, guidance resources and trainers are needed.

- In addition, a forum is needed to continue the Summit dialog and build upon shared experiences.
Education and Communication, cont’d

Recommendations

- Develop training materials and events that support:
  - a range of training formats including webinars, self-paced online training, FAQs, and classroom training
  - different levels of learning (intro, intermediate, advanced) and work roles (metadata creator, manager, user)

FGDC Metadata Working Group

- Establish an ISO metadata ‘Train the Trainer’ program

FGDC Metadata Program
Education and Communication, cont’d

- **Recommendations (cont’d)**
  - Provide regular and clear communication about the standards process and status
    
    *FGDC Metadata Working Group*
  - Create an ISO metadata wiki that is logically organized and actively managed
    
    *NOAA NGDC with FGDC Metadata Working Group*
Metadata Summit: Summary of Feedback
Summit Day Feedback Summary

- Audience Assessment indicated high satisfaction for:
  - Summit as a good forum to communicate about ISO implementation
  - Quality of presentations (informative and good foundation for discussion)
  - Breakout groups well facilitated
  - Opportunity to express opinions and ask questions
  - Information will aid in job performance
Summit Feedback Summary

- Overall recognition that Federal agencies should be moving to ISO now
- Participants saw value in implementation of ISO on a larger scale
- High interest in seeing another Summit offered within 6 months
Next Steps

- FGDC Metadata Summit Webinar recording
- Workshop Summary

Will be available at:

http://www.fgdc.gov/metadata/events/metadata-summit
Comments? Questions?

Send input to:
fgdc@fgdc.gov
Appendix D
Metadata Summit Webinar Question and Answer Session

Q: Are you aware of an agency that has already converted most (or all) of their FGDC metadata records to the ISO standard?
A: Yes. NOAA National Geophysical Data Center (NGDC) has converted all of their resources and maintains them in ISO 19115-2, CSDGM and other formats. NOAA Coastal Data Development Center (NCDDC) is in the process of converting all metadata to ISO 19115-2.

Q: Is there a timeframe for geo.data.gov/geoplatform to utilize ISO metadata?
A: ISO metadata implementation is in progress but no firm implementation date has been set.

Q: In an era of increasingly tight budgets, can future seminars be virtualized?
A: Certainly. It was decided that the initial Summit should be live to support participant interaction and input and that the webinar would be used to distribute the information and outcomes. Telecons, webinars and online options will be the primary forums as we move forward.

Q: I like that you are recording this Webinar for future viewing. Will you also make the PowerPoint document available?
A: The Webinar slides and recording and the more detailed Summit slides, breakout session issue tables and all other related documents are available at: http://www.fgdc.gov/metadata/events/metadata-summit

Q: Is 19157 Data Quality implemented as "stand alone" like feature catalog or integrated like 19119 Web Mapping Services
A: Data Quality is integrated in the current version of ISO 19115. However, Data Quality has been removed and made stand alone in the forthcoming ISO 19115-1 update to ISO 19115. The opposite is true of Feature Catalog (entity/attributes). Feature Catalog is not integrated in the current version of ISO 19115 but is integrated into the ISO 19115-1 update version.

Q: Are there any NAP/FGDC meetups schedule for ESRI Federal User Conference?
A: Yes, the EPA has a meeting planned for Friday morning of the Fed UC in February 2012.

Q: Are there any plans to create a single xml schema that meets several ISO standards so we don't have to make five separate files to replicate what we can do with a single CSDGM file?
A: You will not need to make five separate files to replicate what you can do with a single CSDGM file. However, you are correct that ISO metadata is comprised of a suite of standards commonly referenced as ISO 191** . This is because some of the standards will be used standalone, e.g. use of Data Quality to document organizational QA/QC process or to support functions beyond basic data documentation, e.g. define coordinate systems. As such there is no single ‘one size fits all’ combination of schemas. The effective integration of the standards is addressed during ISO training.

Q: I am getting ready to implement a new GIS for a River Authority, can I go completely ISO and not worry about FGDC standards, especially for sharing our information?
A: Yes. However, you must consider if you can implement the tools (editor, validation schema, clearinghouse, etc.) to fully support ISO and if your community can ingest and utilize ISO.

Q: When is the next call for this group and what are next steps?
A: The best approach to stay informed is to join the FGDC Metadata Working Group (MWG). This forum is serving as the MWGs quarterly telecon. If you are not a member of the MWG, email a request specifying MWG to fgdc@fgdc.gov.

Q: I heard a deadline for May 2013- what was that in reference to?
A: The ISO 19115 five year review update, ISO 19115-1, is expected to be formally finalized and adopted by ISO in May 2013. However, the standard has reached ‘draft international status’ (DIS) and the INCITSL1 leadership has stated that this is significant as DIS standards are considered ‘stable’ at this point, subject only to editorial changes.

Q: Can you recommend by name some stand-alone ISO metadata editors?
A: Please see the FGDC ISO Metadata Editors Review at: [http://www.fgdc.gov/metadata/iso-metadata-editor-review](http://www.fgdc.gov/metadata/iso-metadata-editor-review). Note that a 2012 update to this resource is planned though the format may change slightly to better support direct input by the software developers. However, we do intend to maintain the ‘User Review’ portion of the resource.

Q: Do we have any specific standards for images (rasters)
A: Yes. ISO 19115-2. It fully includes ISO 19115 and adds elements for images, gridded data and other remotely sensed data including monitoring stations, instrumentation, platforms, etc.

Q: Is there a simple how-to document on filling out the ISO metadata in a text file or in a GIS software package like ArcGIS? Is there a simple how-to document for converting existing metadata to the new standard?

Q: I saw brief mention of biological data at the webinar beginning. Is there an ISO standard for biological data?