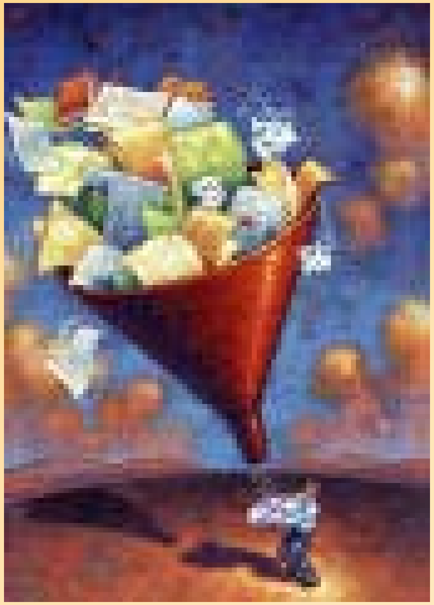
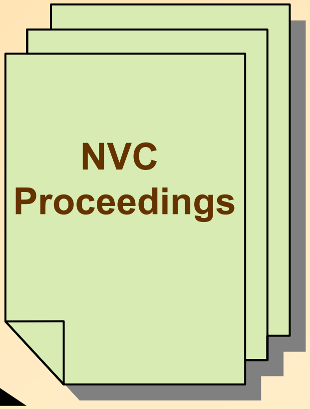
OVERVIEW OF DATA FLOW IN NVC PROCESS





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VegBank and the NVC

- Ecologists have long recognized need to communicate about "community type" or "vegetation type" as a unit of vegetation.
- Vegetation types can be understood as segments along gradients of vegetation composition – more-or-less continuous.
- Conceptualization of vegetation types is derived from analyses of vegetation samples (plots, transects, relevés etc.), **and these samples provide the fundamental records for describing vegetation.**
- Both basic and practical needs for classifying vegetation have led to substantial unification in approaches to vegetation classification – the NVC is one such expression.
- Convergence of basic concepts that underlie establishment and recognition of associations and alliances.

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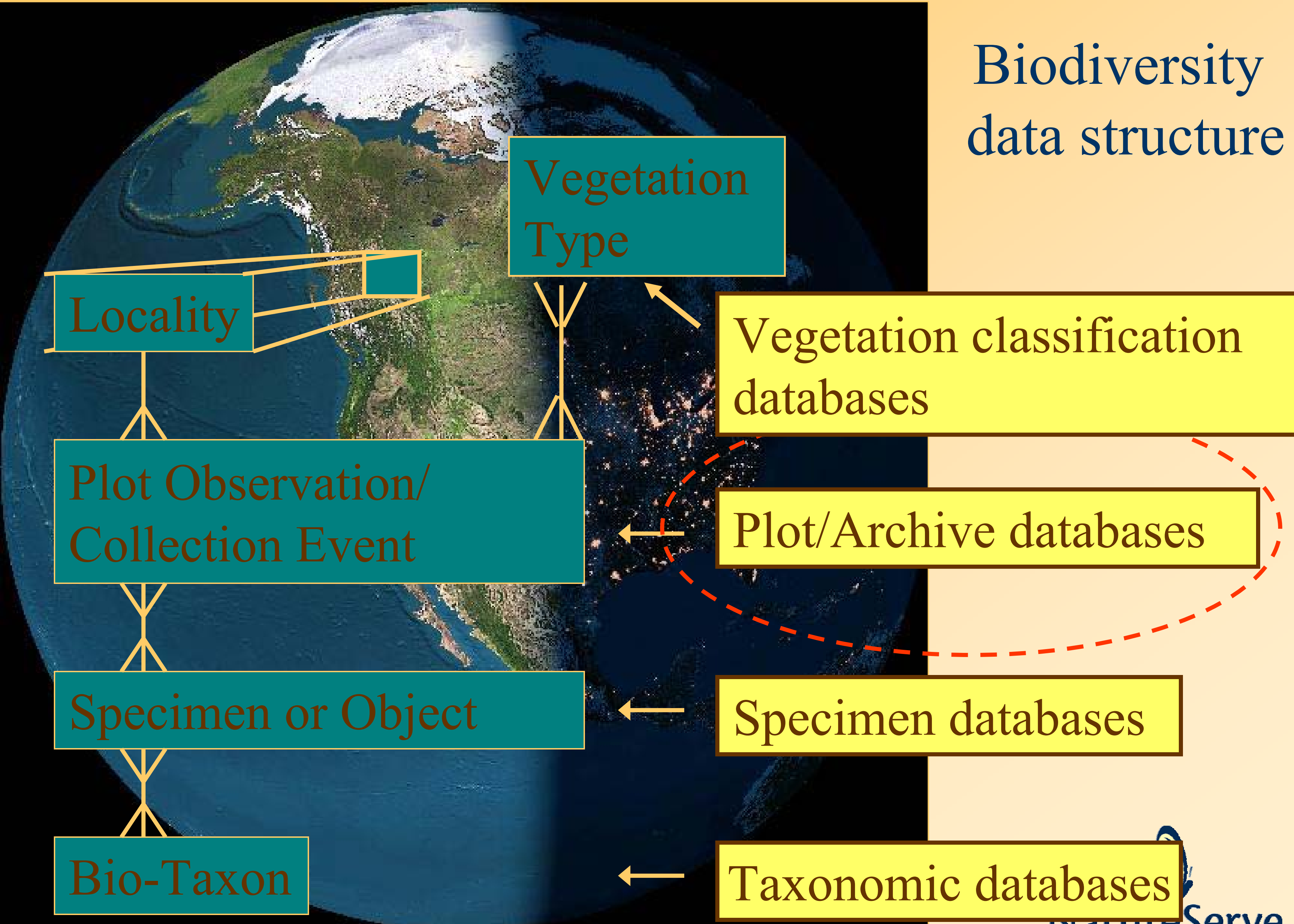
Biodiversity data structure



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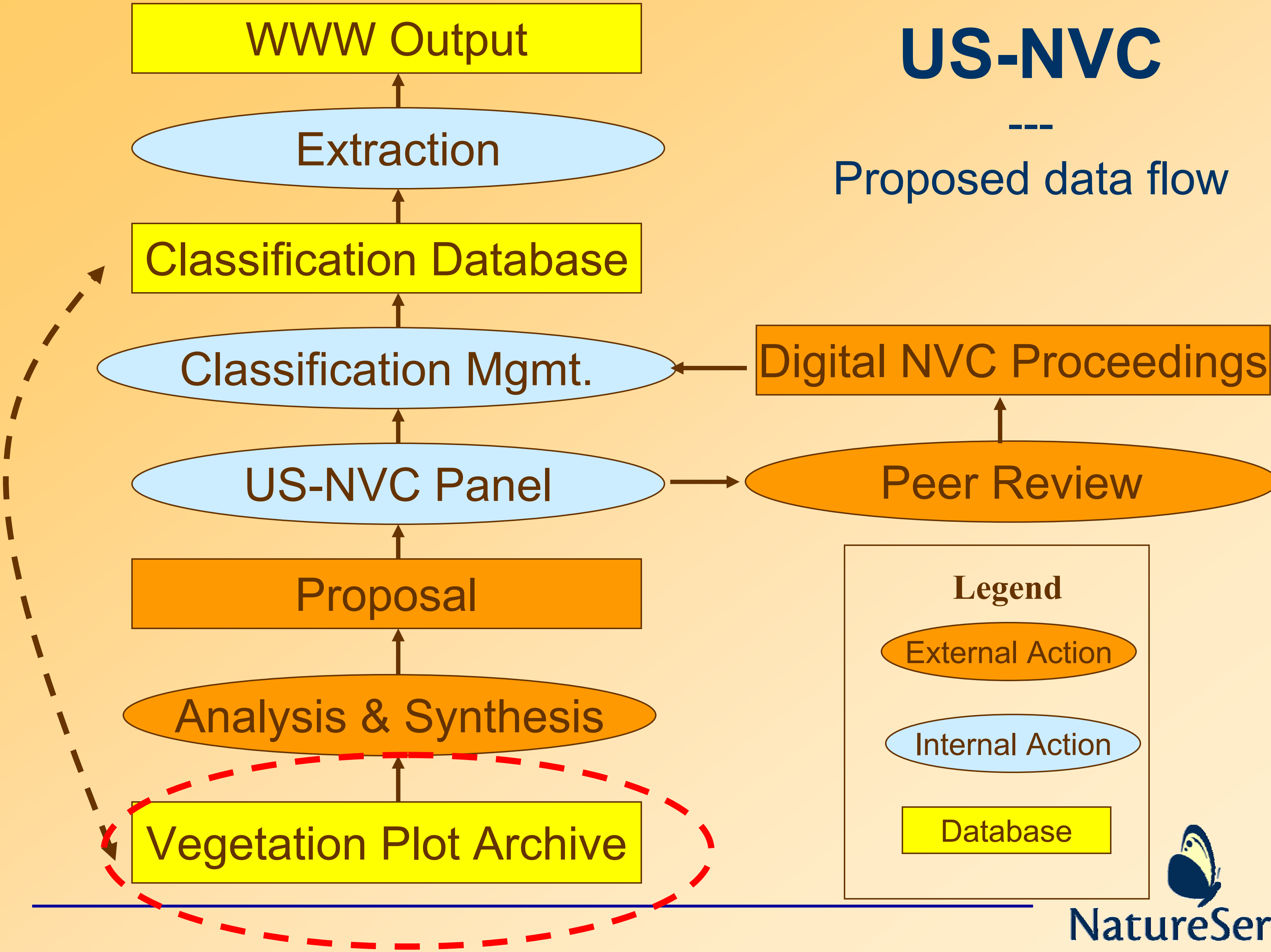
US-NVC

Proposed data flow



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Vegetation Plot Archive: A Missing Piece of the Puzzle

The missing core component is the data infrastructure needed to manage the anticipated 10^7 plots and 10^4 plant associations, and to distribute this over the web in a continually revised, perfectly updated form.

But how were we getting by before?

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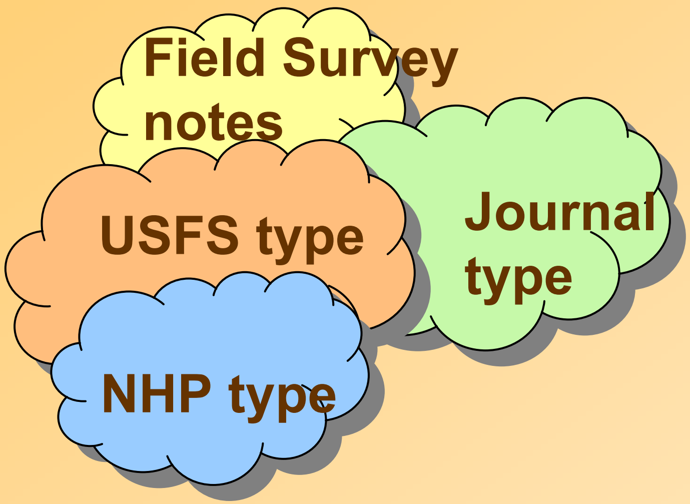
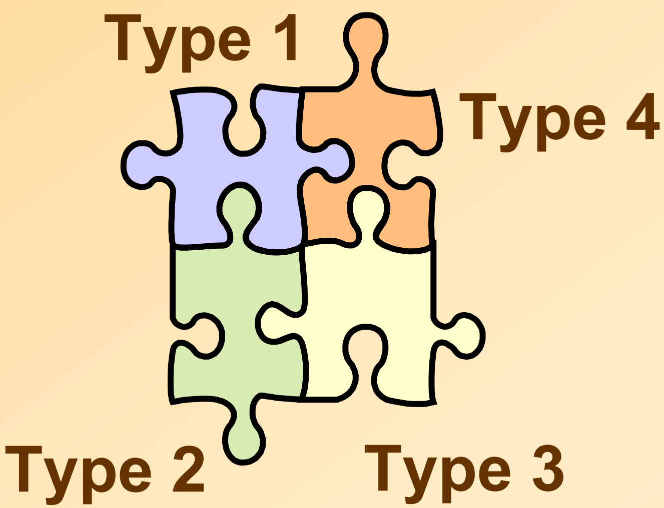
Before Plot Archive

After Plot Archive





Database Solutions to Plot Archives and Other Databases for NVC

Plot data form the quantitative basis for refining the NVC/IVC classification – but they depend on other data and databases.

Plot Data require 3 key databases:

- Classification Databases
  - *Biotics, NatureServe Explorer*
- Taxonomic Databases
  - *ITIS, others*
- Vegetation Plot Databases
  - *VegBank, VegBranch, others?*

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Other Pieces Needed for NVC

But processing of plot data for IVC/NVC also needs another set of processes for interpretation of vegetation types based on plots.

1. Consistent Type Description
2. Peer Review Process
3. NVC Digital Proceedings connecting Type descriptions to Plot database.

VegBank – the Plot Archive Solution

- The ESA Vegetation Panel is currently developing a public vegetation plot archive known as *VegBank* (www.vegbank.org).
- *VegBank* is expected to function for vegetation plot data in a manner analogous to *GenBank*.
- Primary data will be deposited for reference, novel synthesis, and reanalysis, particularly for classification.
- The database architecture can be generalized to most types of species co-occurrence data.

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VegBank

A vegetation field plot archive

Sponsored by:

The Ecological Society of America - Vegetation Classification Panel

Produced at:

The National Center for Ecological Analysis and Synthesis (NCEAS)

Principal Investigators:

Robert K. Peet, University of North Carolina
Michael D. Jennings, U.S. Geological Survey
Dennis Grossman, NatureServe
Marilyn D. Walker, USDA Forest Service

Staff:

P. Mark Anderson, NCEAS
Michael Lee, University of North Carolina

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VegBank is made possible by the support and cooperation of:

Ecological Society of America

National Center for Ecological Analysis and Synthesis

NatureServe

Federal Geographic Data Committee

USGS
Gap Analysis Program

National Biological Information Infrastructure

National Science Foundation

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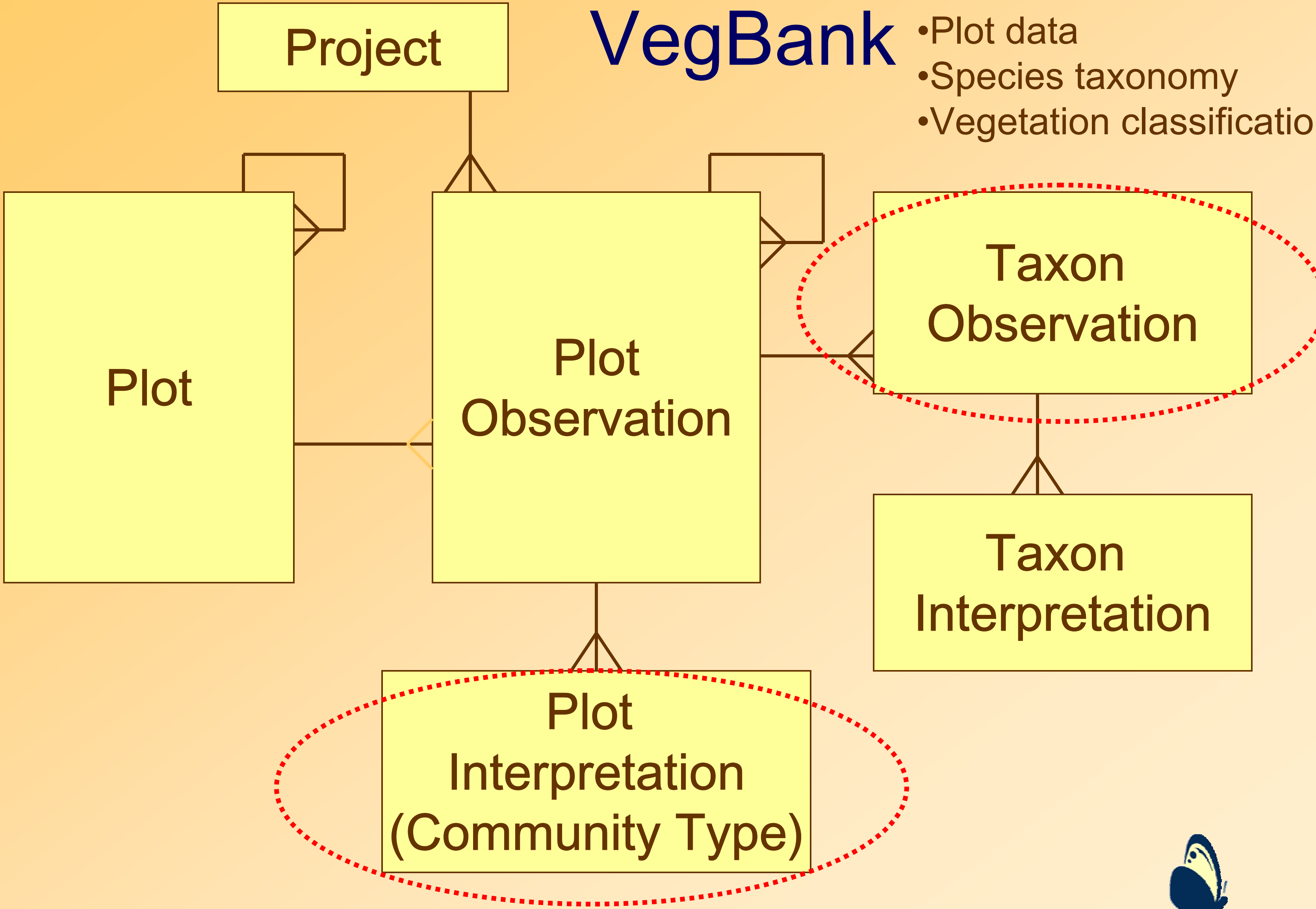
Core elements of VegBank

- Plot data
- Species taxonomy
- Vegetation classification



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The Taxonomic Database Challenge:
Standardizing organisms and communities

The problem:

Integration of data potentially representing different times, places, investigators and taxonomic standards.

The traditional solution:

A standard list of organisms / communities.

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Taxon: Standard Lists are Available

Representative examples for higher plants include:

* *North America / US*

USDA Plants http://plants.usda.gov/
ITIS http://www.itis.usda.gov/
NatureServe http://www.natureserve.org

* *World*

IPNI International Plant Names Checklist
http://www.ipni.org/
IOPI Global Plant Checklist
http://www.bgbm.fu-berlin.de/IOPI/GPC/

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Most standardized taxon lists fail to allow effective integration of datasets

The reasons include:

- Taxonomic concepts are not defined (just lists),
- Multiple party perspectives on taxonomic concepts and names cannot be supported or reconciled,
- The user cannot reconstruct the database as viewed at an arbitrary time in the past.

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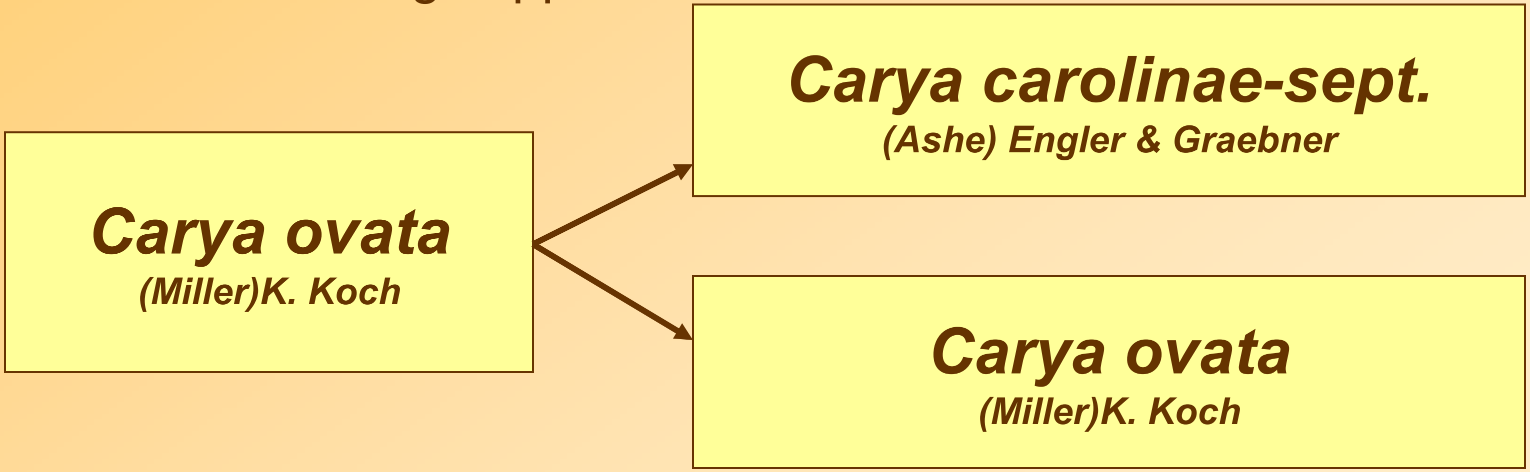
Why current taxon lists fail: Three concepts of shagbark hickory

Splitting one species into two illustrates the ambiguity often associated with scientific names. If you encounter the name "*Carya ovata* (Miller) K. Koch" in a database, you cannot be sure which of two meanings applies.



***sec.* Gleason 1952**

***sec.* Radford et al. 1968**

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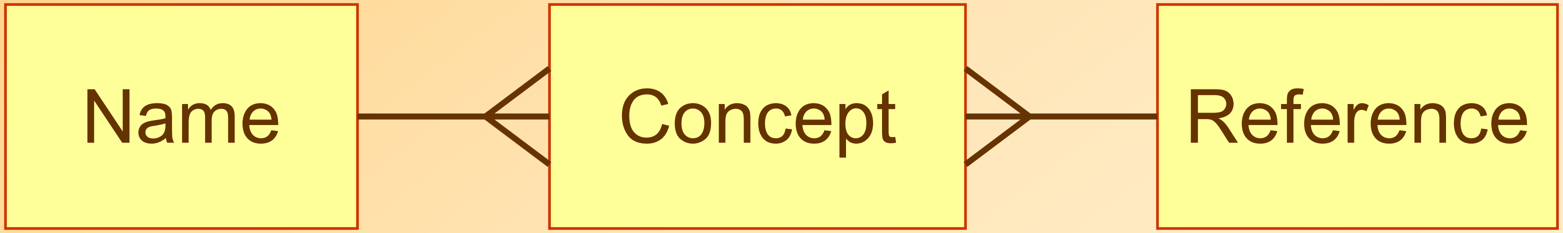
A ***concept*** represents a unique combination of a ***name*** and a ***reference***

"Taxon Concept" is equivalent to "Potential taxon" & "Assertion"



What we wished was available: (Inter)National Taxonomic Database

An upgrade for ITIS etc.?

- Concept-based
- Party-neutral
- Synonymy and lineage tracking
- Perfectly archived

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Plot Database Conclusions

1. A public archive is needed for vegetation plot data.
2. Design for re-observation of plots:
   separate permanent from transient attributes.
3. Records of species should always contain
   a scientific name and a reference (concept-based).
4. Design for future annotation of species and community concepts.
5. Archival databases should provide time-specific views.

Guidelines for Vegetation Classification

The ESA Vegetation Panel and its partners have been working to develop guidelines for the floristic levels of the classification covering:

- Terminology
- Plot data acquisition
- Identification and documentation of vegetation types
- Formal description and peer review of types
- Information dissemination and management.

Version 2.0 released in May 2003

Version 3.0 under review by FGDC as federal standard

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ESA standards for plot data

Four levels of standards:
- Submission (geo-coordinates, dominant taxa)
- Occurrence (area, interpretation)
- Classification (cover values for all taxa)
- Best practice (cover values for all taxa by strata)

Pick lists (48 and counting)

Conversion to common units

Method protocols

Concept-based interpretations of taxa & communities

“Painless” metadata

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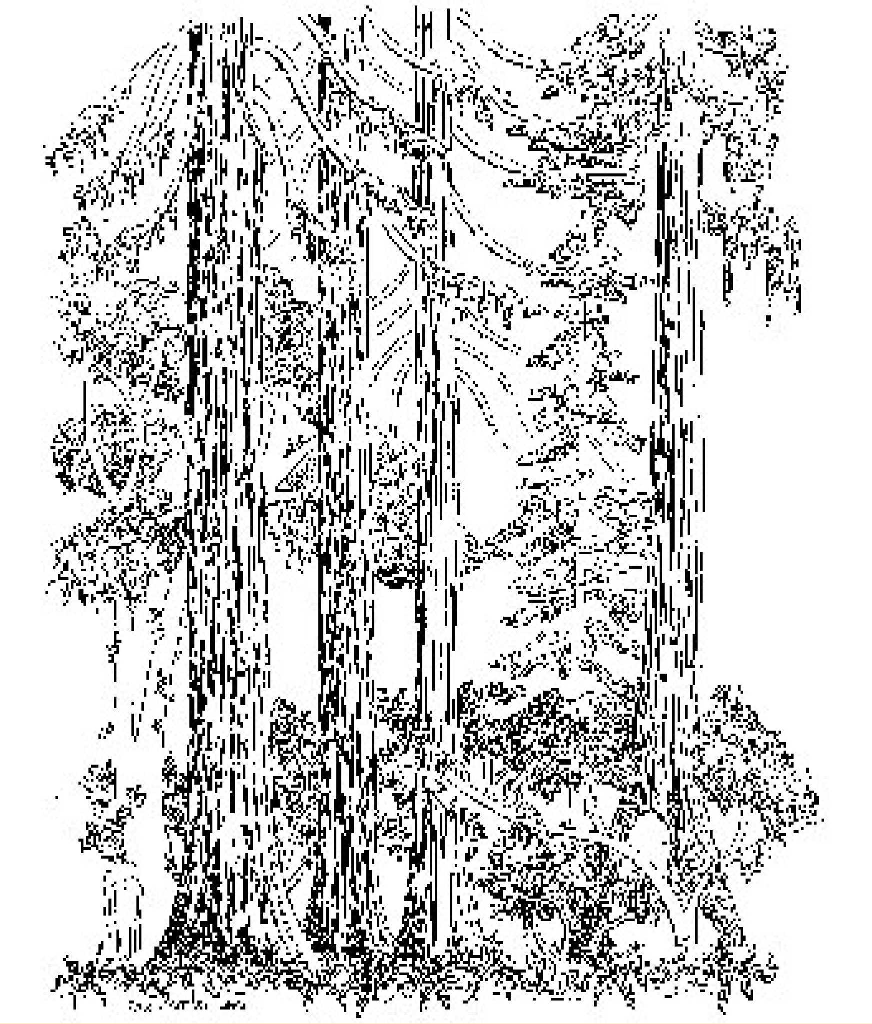
Vegetation Description

Pseudotsuga menziesii – Tsuga heterophylla Forest Alliance
Douglas Fir – Western Hemlock



CANOPY SPECIES

- *Pseudotsuga menziesii* 37.5%
- *Abies grandis* 37.5%
- *Tsuga heterophylla* 37.5%
- *Thuja plicata* 12.5%

Olympic National Park, Mt. Olympus

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Vegetation Description: structure & floristics

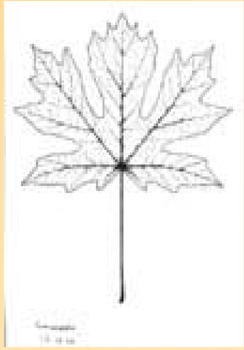
T – TREE LAYER (100%)

T1 (main canopy layer; 100%):

- *Pseudotsuga menziesii* 37.5%,
- *Abies grandis* 37.5%,
- *Tsuga heterophylla* 37.5%,
- *Thuja plicata* 12.5%;

T2 (sub canopy layer; 70%):

- *Tsuga heterophylla* 12.5%
- *Acer circinatum* 62.5%,
- *Rhamnus purshiana* 3%;



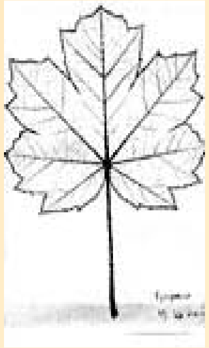
S – SHRUB LAYER (20%)

S1 (tall shrub layer; 15%):

- *Taxus brevifolia* 0.5%,
- *Oplopanax horridus* 7.5%,

S2 (low shrub layer; 20%):

- *Mahonia nervosa* 3%,
- *Gaultheria shallon* 12.5%, etc.



H - HERB LAYER (50%):

M - MOSS LAYER (70%).

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VEGETATION FIELD PLOTS (Guidelines, Chapter 5)

1. *Stand selection and plot design*: How plots/stands were selected and designed.

2. *Physiognomy*: (Optimally), recognize the following strata when present: *tree, shrub, herb,* and *moss* (moss, lichen, liverwort, alga), and in aquatic habitats, *floating*, and *submerged*

3. *Species composition*:
   - Sampling should detect complete species assemblage (one time sampling)
   - A plant name and plant reference
   - Taxon cover (or taxon stratum cover); cover estimated to at least Braun-Blanquet scale.

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VEGETATION FIELD PLOTS (Guidelines, Chapter 5)

4. *Site data*: Elevation, slope aspect, slope gradient. (minimal).

5. *Geographic Data:*
   - Latitude and longitude, decimal degrees and WGS 84 (NAD83) datum,
   - Field coordinates and the datum used.

6. Metadata: Project name/description, methodology for selecting and laying out plots, effort in gathering floristic data, cover scale and strata types, and name/ contact information of lead field investigators.

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DESCRIPTION OF FLORISTIC UNITS (Guidelines, Chapter 6)

1. Names of natural and semi-natural types (nomenclatural rules).
2. Floristic unit. Indicate level of unit described: "Association," Alliance," "Planted/Cultivated."
3. Placement in the hierarchy
4. Classification comments.
5. Rationale for choosing the nominal taxa (the species by which the type is named).
6. Brief description. Provide a brief (1-2 paragraph) summary.
7. Physiognomy.
8. Floristics. Species composition and average cover for all species (preferably by stratum)

   a. Stand table of floristic composition (preferably by stratum)

   b. Summary of diagnostic species.

   c. Taxonomic usage in floristic tables with reference.

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DESCRIPTION OF FLORISTIC UNITS (Guidelines, Chapter 6)

9. Dynamics
10. Environmental description.
11. Description of the range
12. Identify field plots.
13. Evaluate plot data
14. The number and size of plots. Justify the number of and sizes of plots.
15. Methods used to analyze field data.
16. Overall confidence level for the type (High, Moderate, Low).
17. Citations.
18. Synonymy.

GUIDELINES FOR PEER REVIEW (Guidelines, Chapter 7)

1. Peer-review process administered by the ESA Vegetation Panel and appointees.
2. Reviewers should have sufficient regional expertise.
3. Each type will be assigned a confidence level (High, Moderate, Low).
4. Investigators participating in NVC use a defined template for type descriptions.
5. Investigators must place their proposed types within context of existing NVC types – decide if proposed type is distinct, or will refine or upgrade existing type(s) on list.

GUIDELINES FOR PEER REVIEW (Guidelines, Chapter 7)

6. Two kinds of peer review are available.
   a. Types with information sufficient for High or Moderate confidence level, full peer-review process required.
   b. Types with less information, but investigator is convinced type is new to NVC, s/he submits as Low confidence, expedited peer-review process.
7. Full descriptions of types constitutes the NVC primary literature, published in a public digital Proceedings of the NVC.

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DATA MANAGEMENT (Guidelines, Chapter 8)

1. Vegetation Classification Database viewable and searchable over the web. Primary access - NatureServe Explorer (http://www.natureserve.org/explorer/).
2. Users of NVC should cite the website and the explicit version observed.
3. Maintenance of NVC data files by NVC management team. However, definition, redefinition, or change in the confidence level of a vegetation type requires approval of the peer-review team.
4. Plot data for NVC must be archived in VegBank or other public database.

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DATA MANAGEMENT (Guidelines, Chapter 8)

5. Plot data for NVC types must be linked by accession number to types in the Vegetation Classification Database and should be publicly available.
6. If non-VegBank database used, that archive must ensure data permanency and exportability.
7. Proposals for revisions to NVC submitted in digital format using standard templates.
8. Successful proposals posted on the web as Proceedings of the NVC.
9. Each taxon must be reported as a name and publication couplet. Unknown or irregular taxa should also be reported.

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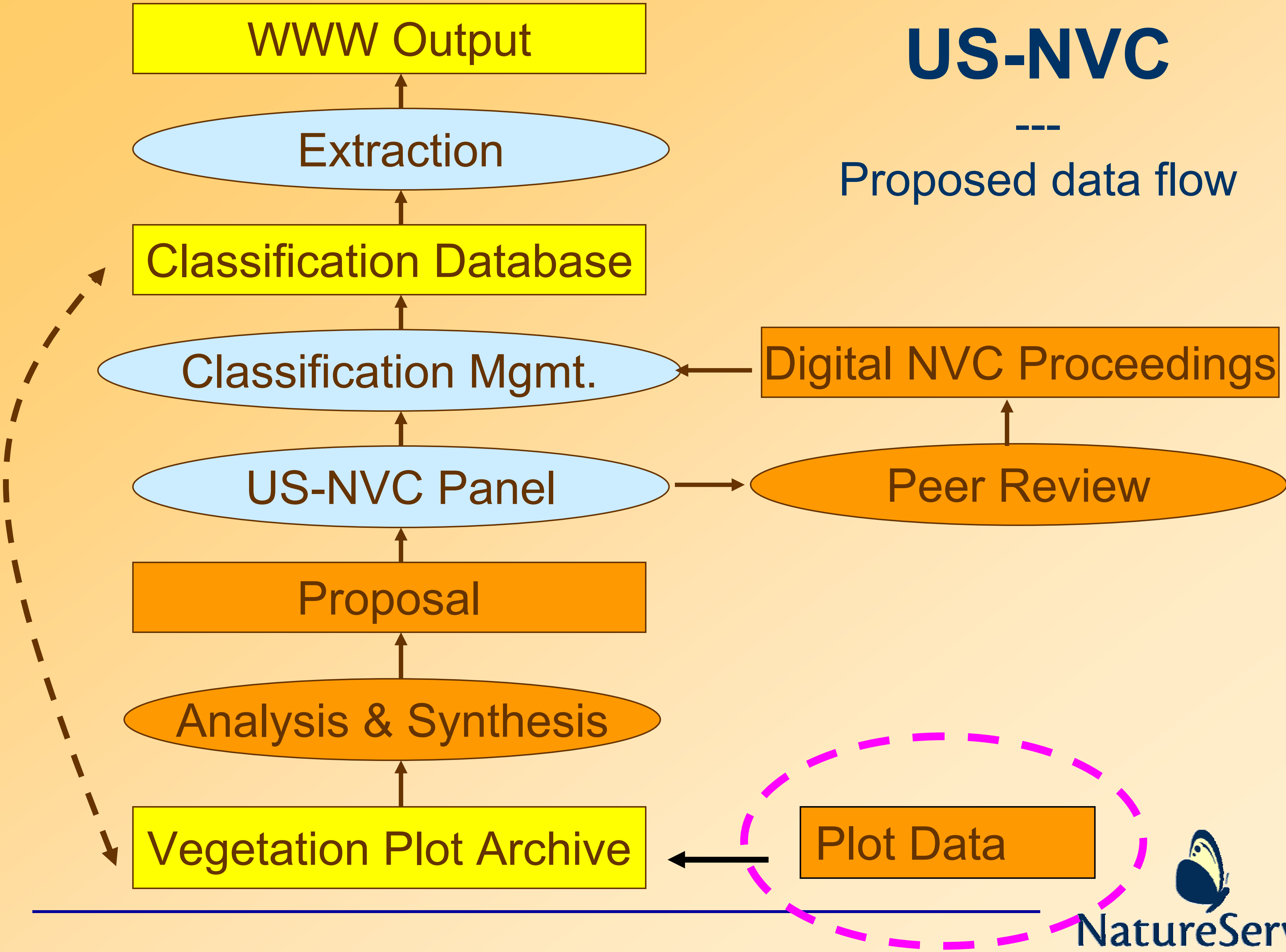
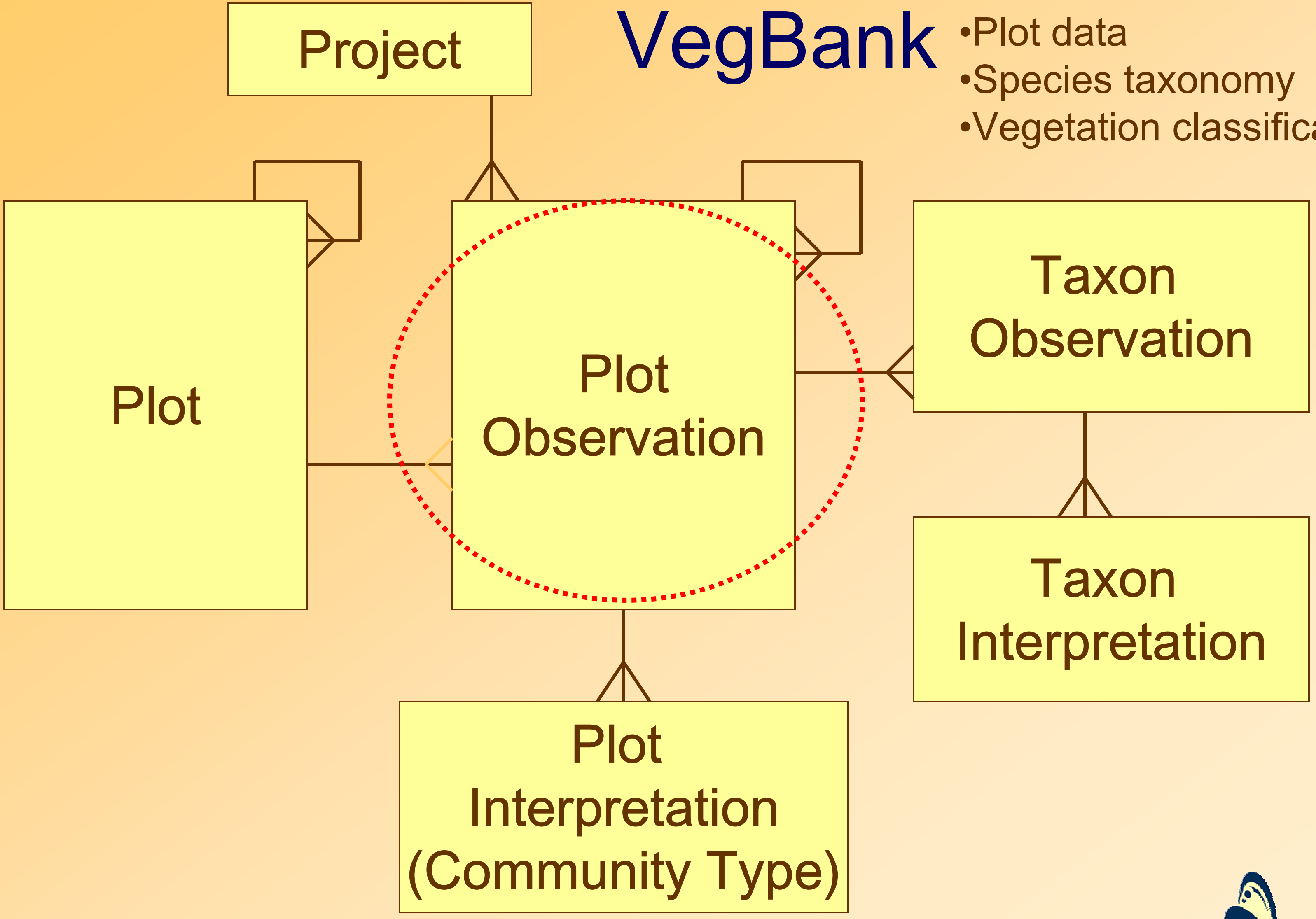
US-NVC

Proposed data flow



Core elements of VegBank

- Plot data
- Species taxonomy
- Vegetation classification



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Plot Data – Data Entry & Management

Multiple Options:

- **Excel spreadsheets – VegBranch**
- **Access database - VegBranch**
- **NPS PLOTS database**
- **VegBranch**
- **Other Databases – XML links**

DATA UPLOAD & DOWNLOAD

1. VegBranch → XML → VegBank

2. VegBank → SQL file → VegBranch

3. Other Databases ← → XML ← → VegBank

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VegBank Client Interface Tools

- Desktop client for data preparation (VegBranch),
- Flexible data import,
- Standard query, flexible query, SQL query,
- Flexible data export,
- Tools for linking taxonomic and community concepts,
- Easy web access to central archive.

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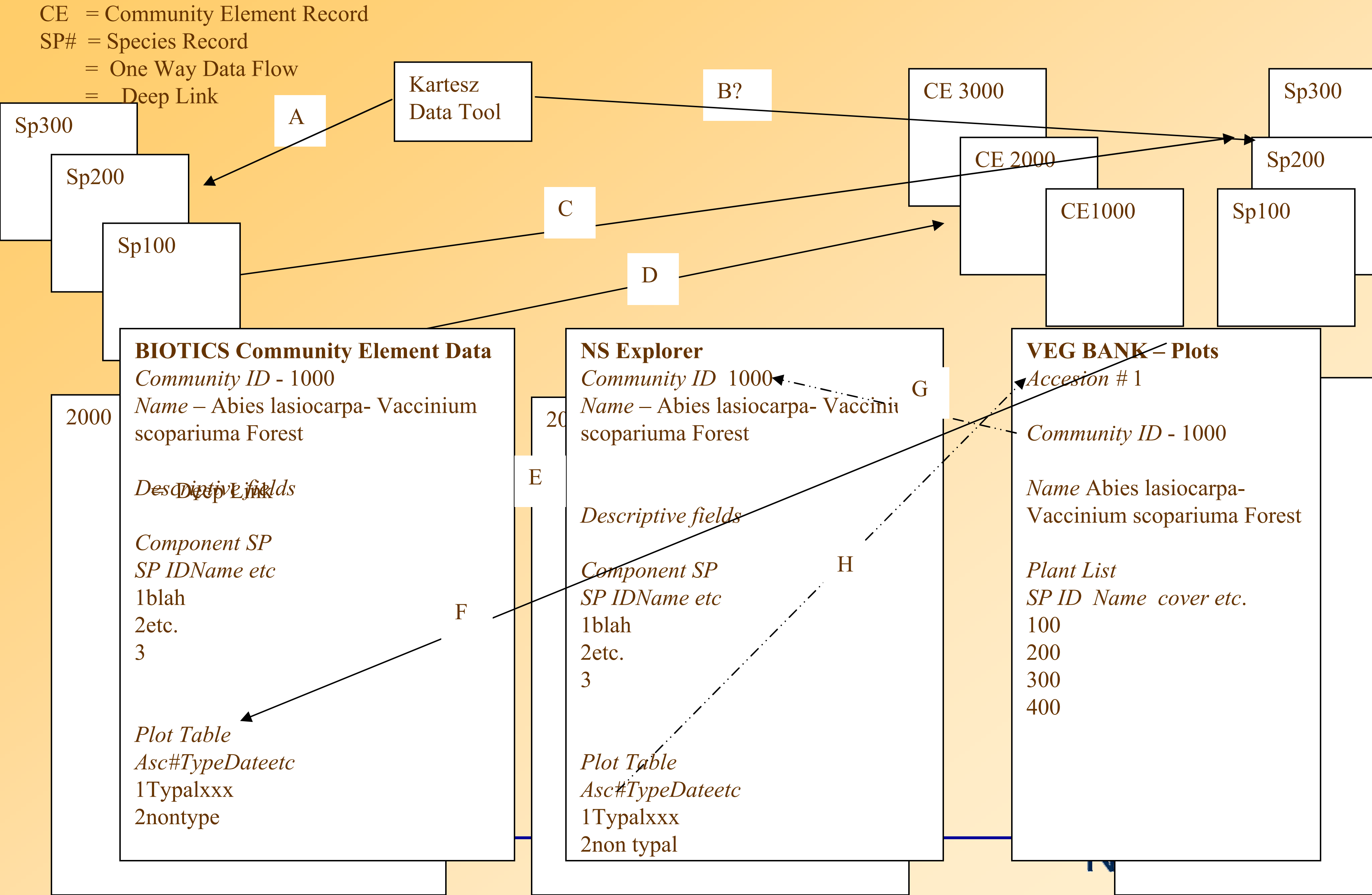
Connectivity of Databases



Building Vegetation Datasets with VegBank

How will ecologists in universities, heritage programs, federal agencies, etc. be able to move their data into VegBank?

1. Why do it?
2. How to do it?
3. When to do it?

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OTHER APPLICATIONS

Massive plot data have the potential to create new disciplines and allow critical syntheses.

- Remote sensing. What is really on the ground?
- Theoretical community ecology. Who occurs together, and where, and following what rules?
- Monitoring. What changes are really taking place in the vegetation?
- Restoration. What should be our restoration targets?
- Vegetation & species modeling. Where should we expect species & communities to occur after environmental changes?

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LONG TERM USE & DATA MIGRATION PLANS

1. Sustainable Support for VegBank
2. Partnership among supporters of NVC based on plot data and NVC process
3. Compiling Data Sets

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